

**SAN JUAN RIVER BASIN  
RECOVERY IMPLEMENTATION  
PROGRAM**

**ANNUAL BUDGET AND WORK PLAN**

**FISCAL YEAR 1999**

**PREPARED FOR  
SJRP COORDINATION COMMITTEE**

**PREPARED BY  
SJRP BIOLOGY COMMITTEE**

**December 4, 1998**

**Habitat Mapping** ..... 28

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**Program Management . . . . . 37**

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# San Juan River Basin Recovery Implementation Program - Budget for FY99

|   | Agency      | Program    | BIA<br>Direct | Other<br>Direct |
|---|-------------|------------|---------------|-----------------|
| <b>III. Research Activities</b>             |             |            |               |                 |
| Suppression of Red Shiner                   | UNM/NMDGF   | \$ 29,700  |               |                 |
| Population estimates at five locations      | Miller      | \$ 31,246  |               | \$ 14,025       |
| Population estimates at five locations      | KB/ERI      |            | \$ 119,218    |                 |
| Nursery habitat characterization & Use      | Utah        | \$ 81,650  |               |                 |
| Entrainment of stocked Larval Fish at Cudei | Utah        | \$ 10,120  |               |                 |
| Larval Pikeminnow Drift-netting             | UNM         | \$ 27,370  |               |                 |
| Subtotal                                    |             | \$ 180,086 | \$ 119,218    | \$ 14,025       |
| <b>IV. Recovery Efforts</b>                 |             |            |               |                 |
| Catfish removal                             | USFWS, ABQ  | \$ 77,000  |               |                 |
| Evaluation of Stocked Razorback Sucker      | USFWS, G.J. | \$ 38,500  |               |                 |
| Larval Razorback Collection                 | USFWS, G.J. | \$ 12,200  |               |                 |
| PIT Tags*                                   | USBR        | \$ 61,860  |               |                 |
| Subtotal                                    |             | \$ 189,560 | 0             |                 |
| TOTAL - ALL CATEGORIES                      |             | \$ 719,500 | \$ 426,948    |                 |
| <b>Funding Sources</b>                      |             |            |               |                 |
| Jicarilla Apache Tribe                      |             |            |               | \$ 14,025       |
| USBR  |             | \$ 400,000 |               |                 |
| BIA/NIIP                                    |             | \$ 128,000 | \$ 426,948    |                 |
| BIA/Albuquerque                             |             | \$ 50,000  |               |                 |
| USFWS                                       |             | \$ 126,500 |               |                 |
| Credit from 1998 Utah Budget                |             | \$ 15,000  |               |                 |
| TOTAL AVAILABLE                             |             | \$ 719,500 | \$ 426,948    |                 |
| Balance (shortfall) for total request       |             | \$ 0       | \$ 0          | \$ 0            |

\* Purchased items - no specific work plan shown.

**SAN JUAN RIVER BASIN RECOVERY IMPLEMENTATION PROGRAM  
ANNUAL BUDGET  
FISCAL YEAR 1999**

**San Juan River Basin Recovery Implementation Program - Budget for FY99**

|  | Agency      | Program    | BIA<br>Direct | Other<br>Direct |
|--|-------------|------------|---------------|-----------------|
| <b>I. <u>Monitoring</u></b>                    |             |            |               |                 |
| Adult Fish Community Monitoring                | USFWS, G.J. | \$ 43,900  |               |                 |
| Larval Drift - Colorado Pikeminnow             | UNM         | \$ 35,834  |               |                 |
| Larval Drift - Razorback                       | UNM         | \$ 21,212  |               |                 |
| Specimen ID                                    | UNM         | \$ 35,938  |               |                 |
| YOY/Small Bodied fish monitoring               | NMDGF       | \$ 57,200  |               |                 |
| Adult/YOY monitoring participation             | Utah        | \$ 2,770   |               |                 |
| Fish Health                                    | FWS Pinetop | \$ 7,000   |               |                 |
| Videography*                                   | USBR        | \$ 8,000   |               |                 |
| Channel Morphology                             | KB          |            | \$ 104,835    |                 |
| Habitat Mapping                                | KB/ERI      |            | \$ 39,700     |                 |
| Water Temperature Monitoring                   | KB          |            | \$ 5,293      |                 |
| Water Quality Monitoring                       | KB          |            | \$ 22,000     |                 |
| Maintain GIS Database                          | KB          |            | \$ 22,394     |                 |
| Subtotal                                       |             | \$ 211,854 | \$ 194,222    |                 |
| <b>II. <u>Program Management/Reporting</u></b> |             |            |               |                 |
| Program Management                             | USBR        | \$ 30,000  |               |                 |
| Program Coordination                           | USFWS, ABQ  | \$ 38,000  |               |                 |
| Completion of flow recommendation<br>report    | BioWest     | \$ 20,000  |               |                 |
| complete the Synthesis report                  | BioWest     | \$ 40,000  |               |                 |
| Peer Review                                    | BioWest     | \$ 10,000  |               |                 |
| Data Integration                               | KB/ERI      |            | \$ 59,348     |                 |
| Final Reports                                  | KB/ERI      |            | \$ 54,160     |                 |
| Subtotal                                       |             | \$ 138,000 | \$ 113,508    |                 |

San Juan River Basin Recovery Implementation Program - Budget for FY99

|                        | Agency | Program    | BIA<br>Direct | Other<br>Direct |
|------------------------|--------|------------|---------------|-----------------|
| Totals by Entity       |        |            |               |                 |
| USFWS - Grand Junction |        | \$ 94,600  |               |                 |
| USFWS - Albuquerque    |        | \$ 115,000 |               |                 |
| USFWS - Pinetop        |        | \$ 7,000   |               |                 |
| USBR                   |        | \$ 99,860  |               |                 |
| NMGF                   |        | \$ 86,900  |               |                 |
| UNM                    |        | \$ 120,354 |               |                 |
| Utah                   |        | \$ 94,540  |               |                 |
| Bio/West               |        | \$ 70,000  |               |                 |
| Miller                 |        | \$ 31,246  |               | \$ 14,025       |
| KB/ERI                 |        |            | \$ 426,948    |                 |
| Total                  |        | \$ 719,500 | \$ 426,948    | \$ 14,025       |

## **Methods:**

Daily drift samples will be collected at two predetermined localities (Four Corners and Mexican Hat) starting in early July and continuing until the end of August. Nets will be set each day at dawn and dusk and left in the water for about two-hours. The amount of water filtered by each net ( $m^3$ ) will be measured by mechanical flow-meters suspended in the center of the nets. This information ( $m^3$ ) will allow us to determine catch per unit effort based on volume of water sampled versus time sampling.

At the end of each two-hour net-set period, the contents of each net will be rinsed into separate one-gallon plastic bags, labeled with unique field numbers, and preserved in 10% formalin. Drift material will be allowed to cure for at least two days before samples are processed and fishes separated from the debris. As we have done since assuming responsibility for this work, samples will be picked in the field. Unprocessed debris and cleaned samples will be returned to the laboratory for analysis. All fish specimens will be identified and counted. In addition, specimens will be assigned to more coarse categories such as "drift" and "incidental". The former category refers to individuals with minimal or no control over their longitudinal movement. The latter classification refers to individuals whose developmental stage should have allowed them to avoid capture in passive drift nets.

Collection data will be converted to catch rate and compared across and within sites by species. In addition, catch rate between and within sites will be compared across time. Specimens will be distinguished and compared by residence status (native versus non-native) and catch rate overlaid with the annual hydrograph.

In addition to drift-net sampling at the two stations, we will coordinate with San Juan River researchers who are tracking the movements of Colorado pikeminnow in an effort to identify the putative spawning areas for that species. If adult Colorado pikeminnow are tracked to presumed spawning bars, we will establish study sites immediately downstream of those areas. Daily larval fish sampling, using MEC and other appropriate collecting devices, will be conducted for a 7-10 day period when larval Colorado pikeminnow are thought to be leaving the nests and beginning the drift portion of their life history.

## **Products:**

Separate draft reports for the 1999 passive larval drift sampling activities and collection efforts downstream of the putative spawning bar will be prepared and distributed to the San Juan River Biology Committee for review by 31 March 2000. Upon receipt of written comments, that report will be finalized and disseminated to members of the San Juan River Biology Committee by 1 June 2000. Fish collected from those studies will be curated in the Division of Fishes, Museum of Southwestern Biology (MSB), Department of Biology, at the University of New Mexico. Original field notes will be retained in the Division of Fishes and collection information will be electronically stored in a permanent MSB database program. Electronic

**Adult/Juvenile Fish Community Monitoring  
Fiscal Year 1999 Project Proposal**

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**Study Area:**

The study area for adult/juvenile monitoring extends from river mile (RM) 180.0 (Animas River confluence) in Farmington, New Mexico, downstream to RM 2.9 (Clay Hills Crossing) just above Lake Powell in Utah. The entire reach of river from RM 180.0 to RM 2.9 will be sampled in the fall of every year (probably second to third week in September).

**Collections:**

All non-native fish collected will be removed from the river. All native fish collected will be returned live.

**Background:**

Studies performed before 1991 documented a native San Juan River fish fauna of eight species, including Colorado pikeminnow (previously known as Colorado pikeminnow), razorback sucker, and roundtail chub and provided baseline information on distribution and abundance of native and introduced fish species in the San Juan River. Main channel fish community monitoring studies (known as "adult monitoring") performed from 1991 to 1998 refined this baseline data and provided data on specific habitat usage by rare fish species. Adult monitoring has proven to be the most effective tool for monitoring populations of stocked razorback sucker and recently stocked adult Colorado pikeminnow. In addition adult monitoring has recently captured numerous stocked, early life stage Colorado pikeminnow. Information gathered during adult monitoring also aided in the selection of specific sites for detailed hydrologic measurements and larval drift sampling. Integration of adult monitoring data with data from Colorado pikeminnow macrohabitat studies, razorback sucker experimental stocking studies, tributary and secondary channel studies, fish health studies, contaminants studies, habitat mapping studies, and non-native species interaction studies, helped provide data to make flow recommendations for reoperation of Navajo Reservoir.

Thirty intensive electrofishing surveys conducted from 1991 to 1998 have expanded our baseline knowledge on the distribution and abundance of the San Juan River fish community. As of August 1998 (data are not yet available from the October 1998 adult monitoring trip), nineteen wild Colorado pikeminnow have been collected and PIT-tagged; 13 of the 19 Colorado

pikeminnow were radio-tagged. In addition, 10 adult and 43 juvenile, experimentally-stocked Colorado pikeminnow have been recaptured. Twenty-two roundtail chub were collected, 18 of these were PIT-tagged. No wild razorback sucker were collected, however 62 of 68 recaptured, stocked razorback sucker have been recaptured during adult monitoring. FLOY-tagged native suckers have yielded data about the movement of these species in relation to four instream diversion structures in the area of Farmington, New Mexico.

The need for a long-term, standardized monitoring program, such as the adult monitoring study is addressed in objective 5.7.1, a Milestone in the San Juan River Long Range Plan. Additionally, future monitoring will help determine fish community response to reoperation flows from Navajo Dam (objective 5.2.10), as well as monitoring both wild and augmented populations of Colorado pikeminnow and razorback sucker (objective 5.3.9). Further monitoring of experimentally-stocked, adult Colorado pikeminnow and FLOY-tagged native suckers will help address objective 5.2.9, specifically 5.2.9.1 by examining the movements of these fish in relation to the diversion structures near Farmington, New Mexico.

Adult monitoring will continue with one trip in fall 1999, to measure fish community response to reoperation flows from Navajo Dam, monitor populations of experimentally-stocked Colorado pikeminnow and razorback sucker, and assess impacts of instream diversion structures to native fish species. In support of objective #5 below, nonnative fish removal will continue to be done on all adult monitoring trips. In support of objective #4 data collected from recaptured, FLOY-tagged fish collected in the Farmington to Hogback Diversion (New Mexico) reach will continue to be examined to evaluate the impact of instream diversion structures in this reach of river on the movement of native fish species. The study design for adult monitoring is based upon the latest draft criteria for long-term monitoring of the San Juan River main channel fish community. These criteria are currently being finalized by the San Juan River Biology Committee.

#### **Objectives:**

- 1.) Determine shifts in fish community structure, abundance and distribution, and length/weight frequencies under the reoperation flow regime.
- 2.) Monitor Colorado pikeminnow population trends (spawning and staging areas, habitat needs).
- 3.) Monitor experimentally stocked razorback sucker and Colorado pikeminnow (growth rates, dispersal patterns and habitat use).
- 4.) Continue evaluation of movement data and rare fish distribution to determine the extent to which current structures (dams, weirs, etc.) may impeding endangered fish movement.

- 5.) Remove nonnative fish species which prey upon and compete with native fish species in the San Juan River.
- 6.) Finalize report for results and findings from 1991-1997 adult monitoring studies. Produce a report for results and findings of 1998 adult monitoring field work.

### **Methods:**

Objectives 1-6: One adult/juvenile sampling trip will take place in fall 1999. The fall trip will sample from the Animas River confluence (New Mexico) to Clay Hills Crossing, Utah. Electrofishing will be the primary sampling technique, although seining and trammel netting may also be employed. Radio tracking will be conducted on the adult/juvenile monitoring trip if there are rare fish with active radio tags.

Two oar-powered rafts, with one netter each, will electrofish in a continuous downstream fashion, with one raft on each far shoreline. No outboard motors will be used. Sampling crews will consist of approximately 10-13 people (4 for electrofishing, 3-4 for baggage rafts, and 2-5 for other research elements that are being done simultaneously with our sampling). Electrofishing will be conducted in a continuous downstream fashion, sampling two out of every three miles (approximately 120 total sampled miles). All fish collected will be enumerated by species and life stage every sampled mile. Every fifth sampled mile (designated mile), all fish collected will be weighed, measured, and sexed if possible. All native fish collected will be returned alive to the river. All nonnative fish collected will be removed from the river. All predatory lacustrine fishes (ie. - walleye, striped bass, largemouth bass, small mouth bass, etc.) collected will be weighed, measured, and have stomach contents taken, before being removed from the river. Tag numbers, total length, and weight will be recorded on all recaptured, FLOY-tagged fish (both native and nonnative), as well as any rare fish collected. Colorado pikeminnow, roundtail chub, and wild razorback sucker greater than 200 mm TL will be implanted with PIT (Passive Integrated Transponder) tags. Wild, adult Colorado pikeminnow will also be implanted with radio transmitters. Wild, adult razorback sucker will be removed from the river and taken into captivity for use in captive broodstock development. Notes will be kept on any parasites and/or abnormalities observed on collected fishes.

Radio tag implantation and fish transport will follow the protocols attached to the San Juan River Seven Year Research Plan. Electrofishing will follow the methods set forth above and in the long term monitoring plan. Seining and trammel netting will be done where suitable habitat is available at the sampling crews' discretion. The Service will have the lead for these adult monitoring trips and other cooperating agencies will provide personnel and equipment as needed. Costs for cooperating agencies are not included in this budget.

### **Products:**

A draft of the final report for the 1991-1997 adult/juvenile monitoring study is expected to be available by January 1999. A draft report for adult/juvenile monitoring trips conducted in 1998



is scheduled to be available by 31 March 1999. Finalization of both these reports is scheduled to be completed by 1 June 1999. Costs for the finalization of the 1991-1997 adult monitoring report and producing a draft of and finalizing the 1998 adult monitoring report are included in the budget for this workplan. DBASE IV files containing information on total catch and length/weight data gathered on these trips will be submitted for inclusion on the San Juan River Recovery Implementation Program integrated database CD-ROM, by 31 March 1999.

**Budget FY-99:**

**Personnel costs**

|                                |           |
|--------------------------------|-----------|
| 1 GM-13 Supervisor             | \$ 5,000  |
| 1 GS-11 Fishery Biologist      | \$ 15,000 |
| 1 GS- 7 Administrative Support | \$ 1,500  |

|                                      |          |
|--------------------------------------|----------|
| Data analysis and final report costs | \$ 5,000 |
|--------------------------------------|----------|

|                 |          |
|-----------------|----------|
| Travel-Per Diem | \$ 6,500 |
|-----------------|----------|

|                        |          |
|------------------------|----------|
| Equipment and Supplies | \$ 3,000 |
|------------------------|----------|

|          |           |
|----------|-----------|
| Subtotal | \$ 36,000 |
|----------|-----------|

|  |          |
|--|----------|
| Service Administrative Overhead (22.00%) | \$ 7,900 |
|--|----------|

|              |                  |
|--------------|------------------|
| <b>TOTAL</b> | <b>\$ 43,900</b> |
|--------------|------------------|

**San Juan River Larval Fish Passive Drift-netting  
Fiscal Year 1999 Project Proposal**

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and

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**Study Area:**

The two drift-netting stations for this study will be the San Juan River between RM 128 and Mexican Hat (RM 53). If adult Colorado pikeminnow are tracked to presumed spawning bars, we will establish study sites immediately downstream of those areas. In 1998, that locality was near RM 167. Under this scope of this project, we do not anticipate making any collections in the reach of the San Juan River under the jurisdiction of the National Park Service.

**Collections:**

All fish specimens collected will be sorted, identified and preserved for curation in the Division of Fishes, Museum of Southwestern Biology (MSB), Department of Biology, at the University of New Mexico.

**Background:**

Beginning in spring 1995, personnel from the Division of Fishes, Museum of Southwestern Biology (MSB), at the University of New Mexico assumed responsibility for the San Juan River larval fish passive drift-netting study. This project, formerly conducted by the Utah Division of Wildlife Resources, continued with only minor changes in sampling protocol. Data collected from this research activity provided several discrete types of information on the fishes of the San Juan River. Data that can be obtained on the endangered fishes of the river include determining approximate spawning period, identifying approximate location of spawning sites, and assessing effects of annual hydrology (and temperature) on their reproductive activities. Similar data could also be obtained for other members of the ichthyofaunal community and contrasted with previously drift-net sampling to assess the effects of that year's flow regime on fish reproduction. Samples collected during this research program were and will continue to be processed and curated by Fish Division personnel at the University of New Mexico.

Since the initiation of this research program, five larval Colorado pikeminnow have been collected. The two YOY Colorado pikeminnow collected in 1993 (at Mexican Hat) were the same length (9.2 mm TL; MSB 18098, 18099) and were taken on consecutive days in late July (26-27). From these two individuals, we determined the date of spawning to be about 8-9 July 1995.

Two larval Colorado pikeminnow were taken at Mexican Hat during the 1995 larval fish passive drift-netting study. The first specimen, 9.5 mm TL mesolarvae (MSB 26187) was taken between 2114-2310 hours on 2 August 1995. The next morning (3 August 1995) between 0531-0800 hours, a second Colorado pikeminnow, 9.0 mm TL mesolarvae (MSB 26191) was collected. The similar size and developmental stage of these two individuals, in combination with the fact that the two fish were collected within 12 hours of each other, strongly suggest that they were cohorts from a spawning event. From these two individuals, a spawning date between 15-17 July was determined.

A single YOY Colorado pikeminnow was collected in 1996. That specimen was a 8.6 mm TL yolked-mesolarvae taken on 2 August 1996 in a drift net at the Mixer sampling locality (RM 128.0). That individual represents the only larval Colorado pikeminnow collected during drift net sampling at the Mixer. The 1996 back-calculated spawning date for Colorado pikeminnow (18 July 1996) was similar to that predicted in 1995 despite considerable difference in spring peak discharge (1995 - 12,100 cfs; 1996 - 3,450 cfs) and total annual discharge. The 1997 drift netting samples did not yield any Colorado pikeminnow and the 1998 samples are still being processed (> 500 bags of drift debris).

A comparison of 1995 and 1997 morning versus evening drift-net sampling indicated no significant differences in catch rate or ichthyofaunal composition. However, the supplemental data produced by evening sampling provided additional resolution to questions concerning drift patterns. Given the relative rarity of target species in the San Juan River and the extremely limited number of larval Colorado pikeminnow and roundtail chub collected, we redesigned passive drift-netting protocol so that sampling can be conducted during both morning and evening. In addition, we instituted a sampling regime to be conducted during the first week of August that called for nets to be set every other hour when hydrologic and weather conditions allow.

The lack of adult Colorado pikeminnow with functioning radio tags had, until 1998, precluded our attempts to sample the drift below the putative spawning bar during the presumed period of spawning by this species. During August 1998, we conducted an intensive six day sampling effort (ca. 14 hours/day) employing drift-nets and the Moore Egg Collector (MEC) in an area immediately downstream of a putative Colorado pikeminnow spawning bar. Researchers from Miller Ecological Associates had been tracking radio-tagged adult Colorado pikeminnow in that area for at least a week and, given the behavior of the fish, believed that spawning had occurred. Our sampling effort (conducted several days after the hypothesized initiation of spawning) yielded 152 collections and as many sample bags of debris (n=238) as was collected at either

of the two drift netting sites during the tenure of drift sampling. Those samples are still being processed.

If a similar sampling opportunity is available during 1999, we will probably reduce the number of drift-nets and increase sampling with the MEC. Comparative data from 1998 samples will be analyzed to determine differences in sampling efficiency between devices. Depending upon the results of this analysis (which will be completed in early 1999), we will consider switching sampling gear for both phases of this research project (larval drift netting and sampling below the spawning bar).

#### Objectives:

- 1.) Determine the temporal distribution of San Juan River ichthyoplankton in relation to the hydrograph
- 2.) Provide comparative analysis of the reproductive success of San Juan River fishes
- 3.) Attempt to characterize downstream movement of ichthyoplankton
- 4.) Attempt to validate presumed spawning period of Colorado River pikeminnow
- 5.) Institute a short-term but intensive sampling regime in the proximity of the presumed Colorado pikeminnow spawning bed using the MEC as the principal collecting device.

Table 1. Summary of larval and YOY Colorado pikeminnow collected in the San Juan River during larval drift-netting (1993-1998) and back-calculated dates of spawning.

| Field Number | MSB Catalog Number | Number specimen | Total Length | Date Collected | Date Spawned | River Mile | Sampling Method |
|--------------|--------------------|-----------------|--------------|----------------|--------------|------------|-----------------|
| MH72693-2    | 18098              | 1               | 9.2          | 26 Jul 93      | 08 Jul 93    | 53.0       | drift netting   |
| MH72793-2    | 18099              | 1               | 9.2          | 27 Jul 93      | 09 Jul 93    | 53.0       | drift netting   |
| JPS95-205    | 26187              | 1               | 9.2          | 02 Aug 95      | 15 Jul 95    | 53.0       | drift netting   |
| JPS95-207    | 26191              | 1               | 9.0          | 03 Aug 95      | 17 Jul 95    | 53.0       | drift netting   |
| WHB96-037    | 29717              | 1               | 8.6          | 02 Aug 96      | 18 Jul 96    | 128.0      | drift netting   |
| <b>TOTAL</b> |                    | <b>5</b>        |              |                |              |            |                 |

## **I. MONITORING**

copies of the field and collection data will be transferred to the San Juan River database manager following the successful protocol previously employed.

**Budget FY-99:**

**Personnel**

|                            |           |
|----------------------------|-----------|
| Field Research Associate   | \$ 8,000  |
| Field Research Technicians | \$ 14,400 |

|          |           |
|----------|-----------|
| Subtotal | \$ 22,400 |
|----------|-----------|

**Travel and per diem**

|                |          |
|----------------|----------|
| Travel         | \$ 2,160 |
| Field per diem | \$ 3,600 |

|          |          |
|----------|----------|
| Subtotal | \$ 5,760 |
|----------|----------|

**Equipment and Supplies**

|                               |          |
|-------------------------------|----------|
| Equipment upkeep              | \$ 500   |
| Sampling/Field Gear           | \$ 1,500 |
| Laboratory Equipment/supplies | \$ 1,000 |

|          |          |
|----------|----------|
| Subtotal | \$ 3,000 |
|----------|----------|

|       |           |
|-------|-----------|
| Total | \$ 31,160 |
|-------|-----------|

|                |          |
|----------------|----------|
| Overhead (15%) | \$ 4,674 |
|----------------|----------|

|                    |                  |
|--------------------|------------------|
| <b>GRAND TOTAL</b> | <b>\$ 35,834</b> |
|--------------------|------------------|

**San Juan River Larval Razorback Sucker Survey  
Fiscal Year 1999 Project Proposal**

Principal Investigators: Steven P. Platania  
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**Study Area:**

The principal sampling area for this study will be the San Juan River between RM 128 and Mexican Hat (RM 53). If time and funds permit, we will attempt to make one sampling foray in 1999 between Mexican Hat (RM 53) and the Clay Hills boat landing (RM 2.9) just above Lake Powell in Utah. If conducted, this latter sampling effort would include making collections in reaches of the San Juan River under the jurisdiction of the National Park Service.

**Collections:**

All fish specimens collected will be sorted, identified and preserved for curation in the Division of Fishes, Museum of Southwestern Biology (MSB), Department of Biology, at the University of New Mexico.

**Background:**

In 1994, the first series of razorback sucker ( $n=672$ ) were stocked in the San Juan River between Bluff, Utah and the Hogback, New Mexico. Mean length and mass of those individuals, at the time of stocking, was about 400 mm TL and 710 g, respectively. In 1995, 13 of the recaptured razorback sucker were tuberculate males and six of those individuals were ripe. Four recaptured 1995 razorback sucker were determined to be female but, unlike the males, none were sexually mature. In their 1995 report of activities, Ryden and Pfeifer (1996) suggested that the majority of the experimentally stocked San Juan River razorback sucker reached sexual maturity in 1995-96 and that spawning of these individuals might begin in the next two years.

The UNM-NMGF larval fish drift study, whose primary focus was determining spawning period, identifying approximate location of spawning sites, and assessing effects of annual

hydrology (and temperature) on Colorado pikeminnow reproductive activities, provided similar information for other members of the ichthyofaunal community. At the November 1996 San Juan River Biology Committee integration meeting, it was suggested that a portion of the larval fish drift study be expanded to allow for documentation of razorback sucker spawning. However, because reproduction by razorback sucker (March-May) occurred considerably earlier than Colorado pikeminnow (June-July), separate investigations of spawning periodicity and magnitude were necessary for each species.

The most significant potential difference identified between the two studies, besides temporal differences in spawning, was that we were attempting to provide the first documentation of reproduction by individuals (razorback sucker) whose spawning potential had not been determined. Sampling for larval razorback sucker was being conducted with no assurance that the stocked population of adult razorback sucker would spawn in this system. Conversely, we knew from previous studies that Colorado pikeminnow reproduction had and was still occurring in the San Juan River and, because of this certainty, our larval fish sampling efforts for this minnow could be different than those for razorback sucker.

As numerous Upper Colorado River basin researchers had reported light-traps as one of the best means of collecting larval razorback sucker, we too elected to use that sampling procedure during the first year (calendar year 1997) of sampling. The only previous San Juan River fish investigation that employed light-traps was in 1994-1995 (conducted by the National Park Service) near the San Juan River-Lake Powell confluence. The 1994 sampling effort produced an extremely large number of larval fish (ca. 25,000) from a modest number of samples ( $n=20$ ), of which over 99% were red shiner. Similar sampling in 1995 yielded 25,455 specimens in 47 light-traps samples and as in 1994, red shiner numerically dominated the catch. No Colorado pikeminnow or razorback sucker were taken in the 1994-1995 light-trap sampling efforts.

During the 1997 razorback sucker larval fish survey, light traps were set nightly in low-velocity habitats between Aneth and Mexican Hat from late March through mid-June 1997. The traps were distributed at dusk and retrieved about four hours later. Fish taken in those samples were preserved in the field. Sampling success during the 1997 razorback sucker larval fish study was quite poor. While there were over 200 light-trap sets, those sampling efforts produced only 297 fish. Of those, about 200 (66%) were larval suckers (either flannelmouth sucker or bluehead sucker). Larval razorback sucker were not present in the 1997 sampling survey. While there were probably several factors to account for the poor light trap catch rate, a principal factor was the limited access to suitable habitats. Light traps are most effective when set in habitats with little or no water velocity. During our driving survey of riverine habitats in the region (March 1997), we identified numerous locations that appeared to be suitable sites for light trap sampling. However, we found that high flow in the San Juan River eliminated virtually all previously identified low velocity habitats. Further driving reconnaissance failed to yield additional locations to set light traps. Being tied to specific collecting sites was not the most efficient means of collecting large numbers of individuals.

In 1998 we modified our sampling technique to allow for the sampling of a greater portion of the San Juan River and the collection of a significantly larger number of larval fish over a wider



reach of the river. We conducted sampling forays (n=6) at approximately bi-weekly intervals from 17 April (first trip - no larval suckers) to 6 June 1998 between the Four Corners drift-net station (RM 128) and Bluff (RM 80) and used both active and passive sampling techniques to collect larval fish. The primary sampling method was a fine mesh larval seine (in 1998, we collected more larval sucker in a single seine sample than in all of the 1997 light trap samples). Passive sampling techniques were both drift-netting and the use of light-traps. Drift-nets were set periodically to determine if larval sucker comprised a significant portion of the drift community while light-traps were set adjacent to campsites if appropriate aquatic mesohabitats could be located. An inflatable raft was used to traverse this river reach and allow investigators the opportunity to sample habitats that were either not formerly accessible or observable under the constraints of the previous sampling protocol.

The 1998 sampling protocol resulted in the collection of over 13,000 specimens, the majority of which were larval catostomids. This 43-fold increase in number of specimens, as compared with 1997, provided substantially better resolution of spawning periodicity of the sucker community. In addition, the 1998 samples produced enough individuals for investigators to determine, with a high degree of confidence, if razorback sucker reproduction occurred in the San Juan River during that period. None of the aforementioned information was obtainable from 1997 light-trap samples.

Until larval razorback sucker have been collected, we recommend that the protocol currently being used (utilizing as many sampling methods as possible to collect as many larval sucker as possible) be continued. After larval razorback sucker have been collected, the most efficient sampling method can be determined and monitoring protocol can be refined as necessary.

[To date we have not been able to verify spawning by razorback sucker, through the collection of their larvae, during 1998. However, there are a few individual larval catostomids from 1998 samples whose specific identifications have not yet been confirmed by Darrel E. Snyder, CSU Larval Fish Laboratory. We anticipate specific identification of those suckers prior to the end of the calendar year.]

### Objectives:

- 1.) Determine the spawning periodicity of catostomids between mid-April-early June and examine potential correlations with temperature and discharge.
- 2.) Determine if reproduction by razorback sucker occurred in the San Juan River (upstream of Mexican Hat, UT)
- 3.) Provide comparative analysis of the reproductive effort of catostomids.
- 4.) Attempt to validate presumed spawning period of San Juan River catostomids using data from the razorback sucker and Colorado pikeminnow larval fish studies.

### **Methods:**

Sampling for razorback sucker larvae will be conducted in the San Juan River between Four Corners (RM 128) and Mexican Hat (RM 53) from mid-April through early June using sampling techniques that will provide sufficient number of individual fish necessary to meet study objectives. Access to the river shall be acquired through the use of either rafts or canoes. The tentative sampling schedule will be on a bi-weekly (approximately) interval.

Sampling efforts for larval fish will be concentrated in low velocity habitats. Samples in those habitats will be collected with small mesh seines and light-traps. Habitat type, length, maximum depth and substrate of the habitat will be recorded. For seine samples, length and number of each seine haul will be determined. Specimens will be preserved in the field for future laboratory processing. Catch per unit effort will be determined as the number of fish per m<sup>2</sup> sample for seine samples and the number of fish per hour for individuals collected in light-traps.

Catch rate data and compared across and within sites by species. In addition, catch rate between and within sites will be compared temporally (1997 & 1998 samples). Specimens will be distinguished and compared by residence status (native versus non-native) and catch rate overlaid with the annual hydrograph.

### **Products:**

A draft report for the 1999 razorback sucker sampling activities will be prepared and distributed (under a mutually agreed time-frame) to the San Juan River Biology Committee for review. Upon receipt of written comments, that report will be finalization and disseminated to members of the San Juan River Biology Committee. Fish collected from this study will be curated in the Division of Fishes, Museum of Southwestern Biology (MSB), Department of Biology, at the University of New Mexico. Original field notes will be retained in the Division of Fishes and collection information will be electronically stored in a permanent MSB database program. Electronic copies of the field and collection data will be transferred to the San Juan River database manager following the successful protocol previously employed.

**Budget FY-99:**

**Personnel**

|                           |          |
|---------------------------|----------|
| Field Research Associate  | \$ 8,000 |
| Field Research Technician | \$ 4,800 |

|          |           |
|----------|-----------|
| Subtotal | \$ 12,800 |
|----------|-----------|

**Travel and per diem**

|   |          |
|---|----------|
| Travel                                  | \$ 1,755 |
| Field per diem                          | \$ 1,440 |
| Non-Field per diem (meeting attendance) | \$ 450   |

|          |          |
|----------|----------|
| Subtotal | \$ 3,645 |
|----------|----------|

**Equipment and Supplies**

|                               |          |
|-------------------------------|----------|
| Rafting Equipment upkeep      | \$ 1,000 |
| Sampling/Field Gear           | \$ 500   |
| Laboratory Equipment/supplies | \$ 500   |

|          |          |
|----------|----------|
| Subtotal | \$ 2,000 |
|----------|----------|

|       |           |
|-------|-----------|
| Total | \$ 18,445 |
|-------|-----------|

|                |          |
|----------------|----------|
| Overhead (15%) | \$ 2,767 |
|----------------|----------|

|                    |                  |
|--------------------|------------------|
| <b>GRAND TOTAL</b> | <b>\$ 21,212</b> |
|--------------------|------------------|

**San Juan River Specimen Curation And Larval Fish Identification  
Fiscal Year 1999 Project Proposal**

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**Study Area:**

This project does not involve the collection of specimens but instead the processing and curation of samples gathered by the different research components of the San Juan River Research program. The collective sampling area for other researchers will be the San Juan River between Farmington and the Clay Hills boat landing (RM 2.9) just above Lake Powell in Utah.

**Collections:**

Will no samples are collected under this task, the curation of all samples submitted will be in the Division of Fishes, Museum of Southwestern Biology (MSB), Department of Biology, at the University of New Mexico.

**Background:**

Personnel from the Division of Fishes, Museum of Southwestern Biology (MSB), at the University of New Mexico are responsible for two inter-related programs on the San Juan River. The Fish Division is the repository for specimens collected and retained by researchers. Fish taken under these programs are initially sorted by the principal investigator, held until they have submitted their yearly-progress report, and then received by MSB personnel. The collection is accessioned, specimens transferred from formalin to alcohol, identifications verified, individuals enumerated, length ranges recorded (largest and smallest specimen in a collection), collection data verified and transferred to wet labels, and incorporated into a database. Changes in species identifications are noted and returned to the principal investigator along with the entire dataset (listing of collection locality, collectors, date, original field number, species, number of specimens, length ranges, and museum catalog number). In addition to performing duties associated with collections curation, we are also responsible for complete processing (sorting, identifying, counting, curating, and reporting) of selected San Juan River collections (larval drift netting samples, razorback sucker larval fish sampling, spawning bar fish collections). The samples (almost 600) generated by the aforementioned three studies resulted in the collection of over 20,000 larval fish during 1998 (this is an estimate as all samples have not been processed - at present we have sorted and identified over 15,000 larval fish).

In 1998, we processed almost 50,000 larval and juvenile fishes collected by the Utah Division of Wildlife Resources (during 1996) and University of New Mexico-N.M. Game and Fish

researchers (during 1997). The 1997 Utah Division of Wildlife Resources low-velocity habitat samples will be processed beginning in the summer 1999. As in the past, deviations in the identifications of those samples will be noted and forwarded to the principal investigators.

#### **Objectives:**

- 1.) Sort, identify, enumerate, and report on larval fish drift collections
- 2.) Verify species identifications
- 3.) Provide a permanent repository for San Juan River fish collections, field notes, and associated data
- 4.) Assist principal investigators with collection sorting and identifications

#### **Methods:**

Larval fish drift collections generated by UNM-NMGF research projects (Colorado pikeminnow drift-netting study, razorback sucker larval fish survey, Colorado pikeminnow spawning bar larval fish sampling) are received unsorted and processed as stated above. In addition to recording the length ranges for each species in each collection, we also note the presence of larval, juvenile, and adult specimens in the samples. The annual report for the larval fish portion of the study will be prepared by UNM personnel, as it has been since 1995.

We have assisted principal investigators by taking on the responsibility of processing unsorted collections. Specimens are sorted, identified, counted, measured, catalogued, and data submitted to the principal investigator for inclusion in reports. In the past, this work has had to be done on relatively short notice.

Samples from projects are received after the principal investigator has completed their work and prepared the necessary annual report. This means that there will be a lag of one year in reference collection of specimens and processing of those samples. All collections are matched with the appropriate data-sheet, transferred from formalin to alcohol, stored in museum quality jars, re-identified, counted, measured (range), labeled, and catalogued into the permanent MSB Fish Division collection.

#### **Products:**

A draft report of the 1999 San Juan River specimen curation and larval fish identification sampling activities will be prepared and distributed to the San Juan River Biology Committee for review by 31 March 2000. Upon receipt of written comments, that report will be finalization and disseminated to members of the San Juan River Biology Committee by 1 June 2000. Fish collected from this study will be curated in the Division of Fishes, Museum of Southwestern Biology (MSB), Department of Biology, at the University of New Mexico. Original field notes will be retained in the Division of Fishes and collection information will be electronically stored in a permanent MSB database program. Electronic copies of the field and

collection data will be transferred to the San Juan River database manager following the successful protocol previously employed.

**Budget FY-99:**

**Personnel**

|                       |           |
|-----------------------|-----------|
| Research Associate    | \$ 20,000 |
| Laboratory Technician | \$ 7,200  |

|          |           |
|----------|-----------|
| Subtotal | \$ 27,200 |
|----------|-----------|

**Travel and per diem**

|          |        |
|----------|--------|
| Travel   | \$ 600 |
| Per diem | \$ 450 |

|          |          |
|----------|----------|
| Subtotal | \$ 1,050 |
|----------|----------|

**Equipment and Supplies**

|                               |          |
|-------------------------------|----------|
| Laboratory Equipment/supplies | \$ 2,000 |
| Computer supplies             | \$ 1,000 |

|          |          |
|----------|----------|
| Subtotal | \$ 3,000 |
|----------|----------|

|       |           |
|-------|-----------|
| Total | \$ 31,250 |
|-------|-----------|

|                |          |
|----------------|----------|
| Overhead (15%) | \$ 4,688 |
|----------------|----------|

|                    |                  |
|--------------------|------------------|
| <b>GRAND TOTAL</b> | <b>\$ 35,938</b> |
|--------------------|------------------|

**YOY/Small Bodied Fish Monitoring  
Fiscal Year 1999 Project Proposal**

Principal Investigators: David L. Propst and Amber L. Hobbes  
Conservation Services Division  
New Mexico Department of Game and Fish  
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[d\\_propst@state.nm.us](mailto:d_propst@state.nm.us)      [a\\_hobbes@gmfish.state.nm.us](mailto:a_hobbes@gmfish.state.nm.us)

**Study Area:**

The study area for YOY/small bodied fish monitoring extends from river mile (RM) 180.0 (Animas River confluence) in Farmington, New Mexico, downstream to RM 2.9 (Clay Hills Crossing) just above Lake Powell in Utah.

**Collections:**

Specimens collected will be inspected to determine if any rare fishes (Colorado pikeminnow, roundtail chub, and razorback sucker) are present in the seine. Any rare fish > 150 mm TL and all large-bodied native fish (i.e., flannelmouth and bluehead suckers) will be released. All other specimens will be preserved in 10% formalin and returned to the New Mexico Department of Game and Fish Laboratory for identification, enumeration, and measurement (total length and weight).

**Background:**

As set forth in Section 5.7 of the San Juan River Basin Recovery Implementation Program (SJRRIP) Long-Range Plan, a long-term monitoring program "to identify changes in the endangered and other native species populations, status, distributions and habitat conditions" is to be developed by the SJRRIP Biology Committee. In the Ichthyofaunal Monitoring Program document (draft) monitoring was divided into three primary areas, larval fish, young-of-year/small bodied, and subadult and adult/large-bodied fishes. The portion of the San Juan River to be monitored extends from the confluence of the Animas and San Juan rivers (Farmington) to Lake Powell (Clay Hills Crossing). The following work proposal for 1999 is to conduct the young-of-year/small-bodied fishes monitoring effort.

In addition to accomplishing work (field, laboratory, data analysis, and report writing) specific to the young-of-year/small-bodied fish monitoring effort, this proposal includes work that is devoted to other aspects of the San Juan River Basin Recovery Implementation Program.

## **Objectives:**

The objectives of this portion of the San Juan River monitoring effort are to obtain data that will aid in the evaluation of the response (e.g., reproduction, recruitment, and growth) of native and nonnative fishes to different flow regimes and other management actions (e.g., impediment modification), track trends in species populations (e.g., abundance and relative condition) and characterize patterns of habitat use. The data will also be available to all researchers and may be used in conjunction with data obtained in other studies to evaluate future management activities.

## **Methods:**

The study reach (Farmington to Clay Hills Crossing) includes geomorphic reaches 1 through 6, with Reach 1 being the most downstream. As determined by the SJRRIP Biology Committee, sampling will occur every third mile within the study reach. Secondary channels are defined as channels having less than 25% of the volume of flow at the time of sampling and are at least 300 m in length. Inflow at the top of a channel is not necessary for it to be classified as a secondary channel. If any portion of a secondary channel (except mouth) is within a designated sample mile, the secondary channel will be sampled. Young-of-year/small-bodied fish monitoring will occur in conjunction with the large-bodied fish monitoring effort.

All secondary channels in each third-mile will be sampled. Primary channel shoreline habitats will be sampled in 3-mile increments. One primary channel and secondary channel sampling will be within the same river miles. In addition to structured primary channel sampling, all backwaters and embayments ( $> 25 \text{ m}^2$ ) associated with the primary channel within each third-mile will be sampled.

Sample sites within secondary channels will be a sufficient distance from the inflow to and outflow from the secondary channel to minimize primary channel faunal and physiochemical influences. Secondary channel sample sites will be at least 100 and not more than 200 m in length. All mesohabitats (e.g., pool, riffle, riffle-eddy, and shoal) within the site will be sampled in approximate proportion to their availability within the site; typically, at least five mesohabitat types will be sampled in each secondary channel. Each mesohabitat will be sampled separately with  $3.2 \times 1.6 \text{ m}$  (4 mm mesh) drag seines. Each secondary channel sampling effort will be a minimum of 5 seine hauls. The number of seine hauls, total area ( $\text{m}^2$ ) seined, and types of mesohabitats sampled will be recorded on standard field forms. Specimens collected in each mesohabitat will be inspected to determine if any rare fishes (Colorado pikeminnow, roundtail chub, and razorback sucker) are present in the seine. If a rare fish is captured, it will be identified, total length ( $\pm 1 \text{ mm}$ ) and weight ( $\pm 1 \text{ g}$ ) determined, and released. Any rare fish  $> 150 \text{ mm TL}$  will be scanned to determine presence of a PIT tag. If none is present, the specimen will be implanted with a PIT tag having a unique alphanumeric code. All pertinent data (i.e., total and standard lengths, weight, PIT tag code, mesohabitat, water depth, substrate, and cover) on rare fish captured will be recorded. All large-bodied native fish (i.e., flannelmouth and bluehead suckers) will be weighed, measured, and released. All other



specimens will be preserved in 10% formalin and returned to the New Mexico Department of Game and Fish Laboratory for identification, enumeration, and measurement (total length and weight). Field collection number, habitat number, and river mile will be recorded on a waterproof label and placed in each specimen container. Location of site (latitude and longitude) will be determined with a GPS unit. Identification of all retained rare fishes will be confirmed by personnel of the Museum of Southwestern Biology. Preserved specimens will be accessioned to the New Mexico Department of Game and Fish Collection of Fishes or the Museum of Southwestern Biology.

Within each third-mile, shoreline habitats of the primary channel will be sampled. At each designated mile, all mesohabitats (e.g., riffle, debris pool, and shoal) along 200 m (near center of mile) of shoreline will be sampled. All mesohabitats present will be sampled in approximate proportion to their availability within the site. Regardless of the number of mesohabitats present at a primary channel site, at least 5 seine hauls will be made with a drag seine (3.2 x 1.6 m, 4 mm mesh). The shoreline (river right or left) sampled will be dependent upon accessibility of the shoreline. Where more than one shoreline is accessible (and can be seined efficiently), that with greater habitat diversity/complexity will be sampled. Location (latitude and longitude) will be determined with a GPS unit. Specimen and habitat data will be obtained and recorded as required for secondary channel sampling. All retained specimens from primary channel sampling will be preserved separately from the adjacent secondary channel collection. All retained specimens will be accessioned to the New Mexico Department of Game and Fish Collection of Fishes or the Museum of Southwestern Biology.

Backwaters and embayments ( $> 25 \text{ m}^2$ ) not located within structured primary channel sampling sites also will be sampled. During periods of low flow, secondary channel mouths frequently function as backwaters or embayments. In this monitoring effort, secondary channel mouths without surface inflow from upstream will be treated as backwater/embayment habitat. The maximum number of backwaters or embayments sampled will be one per mile. Three seine hauls will be made in each backwater or embayment sampled. All specimens collected, except rare fishes, will be retained and returned to the laboratory for identification and enumeration. All rare fish will be measured and released; those  $> 150 \text{ mm}$  will be PIT tagged. Data collection and recording of relevant information (including GPS determined location) will be the same as for secondary and primary channels.

Water quality data (ambient temperature, water temperature, dissolved oxygen, conductivity, and salinity) will be measured in each sampled secondary channel, at primary channel sites and in backwaters/embayments. Secondary channel water quality data will be obtained a sufficient distance from the inflow to the secondary channel to minimize primary channel influences. All water quality data for each sample will be recorded on standard field forms.

### **Products:**

Data for the October 1999 monitoring effort will be summarized by geomorphic reaches. Minimally, the annual report will report density per species (number/ $\text{m}^2$ ) per geomorphic reach,

size-structure of commonly-collected species populations by geomorphic reach, and rare fishes and the mesohabitats each was found in. Data obtained from secondary and primary channel sampling will be reported separately. Backwater and embayment data will be reported in the primary channel portion of the annual report. Community-comparison metrics, such as the Shannon-Wiener Index and Morisita's Index of Diversity, will be used for longitudinal and annual comparisons. River discharge data (Four Corners gage) will be used to assess the effect of discharge volume on species density estimates. All data obtained during 1999 monitoring activities will be electronically recorded in a format to be determined by the SJRRIP Biology Committee.

The annual report (including electronic database) will be submitted to the SJRRIP Biology Committee by 31 March 2000.

**Budget<sup>1</sup> FY-99:**

|                                       |           |
|---------------------------------------|-----------|
| Young-of-year/small-bodied Monitoring |           |
| Personnel                             | \$ 8,000  |
| Travel and per diem                   | 4,000     |
| Data Compilation                      |           |
| Personnel                             | 15,000    |
| Report Preparation                    |           |
| Personnel                             | 10,000    |
| Administrative Support                | 2,000     |
|                                       | <hr/>     |
|                                       | \$ 39,000 |
| Study Reports and Data Integration    |           |
| Personnel                             | 7,000     |
| Travel and Per Diem                   | 5,000     |
| Administrative Support                | 1,000     |
|                                       | <hr/>     |
|                                       | \$ 13,000 |
| TOTAL                                 | \$ 52,000 |
| Indirect Costs                        | 5,200     |
|                                       | <hr/>     |
| GRAND TOTAL                           | \$ 57,200 |

<sup>1</sup>Budget does not include in-kind contributions

**Fish Disease Monitoring  
Fiscal Year 1999 Project Proposal**

Principle Investigators: John Thoesen, J. Jerry Landye, and Beth McCasland  
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Pinetop Fish Health Center  
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**Study Area:**

The study area for YOY/small bodied fish monitoring extends from river mile (RM) 180.0 (Animas River confluence) in Farmington, New Mexico, downstream to RM 2.9 (Clay Hills Crossing) just above Lake Powell in Utah.

**Collections:**

Five flannelmouth suckers from each designated mile will be taken for fish health analysis. Any non-native fish taken will be from those collections covered under other tasks.

**Background:**

Since October 1992, the Pinetop Fish Health Center has participated on adult monitoring and various smaller sampling trips on the San Juan River from Farmington, NM to Clay Hill, UT. We have collected fish health samples from many different fish species. The original primary concern was the high frequency of lesions observed in various species of fish and whether this problem would affect the endangered Colorado pikeminnows (squawfish) and/or threatened razorback suckers. Upon sampling the San Juan fishery, other pathogens were discovered such as *Bothriocephalus acheilognathi* (Asian tapeworms) and *Ichthyophthirius multifiliis* (Ich). Now that these two species are recruiting in the San Juan River fishery, due to an ongoing stocking program, maintaining and managing fish health of these fish is important.

We propose to collect and maintain a fish health data base during the spring razorback sucker and Colorado pikeminnow spring run-off monitoring trip in FY-99. We also will take non-lethal fish health samples from all razorback suckers and Colorado pikeminnows encountered. Fish pathogens will be monitored and compared to the results of the six years of research. If these pathogens increase, efforts will be made to identify causes. Channel catfish will be lethally sampled in order to provide a fish health inspection of the population prior to transfer to other waters. Additionally, data collected by other San Juan River biologists from the fall adult monitoring will be analyzed for disease incidence.

### Objectives:

- 1) Continue monitoring the health status of San Juan River fish.
- 2) Monitor the fish health status of all Colorado pikeminnows and razorback suckers encountered.
- 3) Obtain fish health inspection samples from non-native channel catfish from selected areas to facilitate transfer of catfish to other aquatic habitats.

### Methods:

- 1) Record macro-pathology on all fish sampled.
- 2) Only selected fish with gross pathology will be sacrificed and sampled for pathogens.  
Non-lethal sample methods will be utilized whenever possible.
- 3) Colorado pikeminnows and razorback suckers will be sampled utilizing non-lethal sampling techniques. If a moribund threatened or endangered fish are encountered, steps will be taken to assist the fish back to good health. If these fail, the fish will be sacrificed and a complete suite of fish health samples will be taken.
- 4) Within each geomorphic reach sampled, designated miles (DM) will be assigned. At each DM, five flannelmouth suckers will be sacrificed. Bacterial and other fish health samples will be collected for epizootic fish pathogens. These suckers are surrogate species for razorback suckers and will enhance the validity of all non-lethal fish health samples.
- 5) Assist other San Juan River biologists by analyzing data collected from electro-fishing boats for disease incidence from the fall adult monitoring trip.
- 6) Annually, sixty fish health inspection samples will be obtained from channel catfish taken from August/September netting and electro-fishing operations. This aspect of fish disease monitoring is in conjunction with the catfish relocation program.

### Budget FY-99:

|  |          |
|--|----------|
| Personnel (field and Laboratory support) | \$ 4,000 |
| Per Diem/Travel                          | \$ 2,000 |
| Equipment (lab and field supplies)       | \$ 1,000 |
| TOTAL                                    | \$ 7,000 |

**Long Term Monitoring - Channel Morphology  
Fiscal Year 1999 Project Proposal**

Principle Investigator: Ron Bliesner  
Keller-Bliesner Engineering  
78 East Center, Logan, UT 84321  
(435) 753-5651 [bliesner@kelbli.com](mailto:bliesner@kelbli.com)

**Study Area:**

The study area consists of the San Juan River and its flood plain from RM 180 (Farmington, NM) to RM 3 (Clay Hills Crossing).

**Collections:**

There are no collections associated with this study.

**Background:**

There are presently 25 river transects that have been established between RM 180 and RM 3 in the San Juan River for purposes of measuring channel scour and deposition. Additionally, substrate composition (sand or cobble/gravel) has been identified during each survey. These cross-sections have been surveyed before and after runoff since 1992. The data from these surveys was used to examine channel scour and deposition, determine change in channel capacity and track change in substrate material. Flow statistics for 8,000 cfs flows were based, in part, on these data.

Maintenance of cobble bars with open interstitial space has been determined to be important for spawning of Colorado Pikeminnow. Four of the sites (RM 173.7, 168.4, 132, 131) that have been identified in the San Juan River as having characteristics suitable for spawning have been monitored since 1995. The results of the surveys at this site were used as part of the basis of the flow recommendation at 8,000 cfs. To verify or adjust this recommendation, these sites will continue to be monitored.

The flow-habitat area model for backwaters is based on the ability of the channel to clean sediment from the system and the rate at which the sediment accumulates in the backwaters after runoff. The amount of perturbation (loss of habitat) due to summer and fall storms has been estimated based on analysis of habitat area data collected before and after storm events. Equivalent data on change in depth of backwaters and depth of sediment have not been analyzed. It is proposed that sediment depth and water depth be measured in backwaters twice yearly at the end of runoff in late July or early August and again in October to assess change. The second sampling will be completed during the fall habitat mapping exercise.

### Objectives:

- 1.) River Geometry Monitoring. Determine short term and long term change in river cross sections at key locations and the relationship of this change to spring runoff and summer/fall storm events.
- 2.) Cobble Bar Monitoring. Determine short term and long term change in cobble bar characteristics in response to spring runoff and summer/fall storm events.
- 3.) Backwater Perturbation Monitoring. Monitor effect of spring runoff and summer/fall storm events on sediment accumulation in backwaters and backwater depth.

### Methods:

- 1.) River Geometry Monitoring. The 23 cross-sections surveyed in 1993-1998 will be surveyed pre- and post-runoff for analysis of annual change and compared to previous surveys to determine trends. Sites will be evaluated in terms of representation of geomorphic reaches and sites added, if necessary to better represent these reaches. Analysis of the change in cross-section geometry and substrate in relation to hydrographic conditions will be completed to monitor response of the system to flow recommendations. Cross-sections will be assessed to identify a subset of three cross-sections per geomorphic reach for long term monitoring. One in each reach will be surveyed every 5 years across the full flood plain to assess effects of high flows.
- 2.) Suspended Sediment Analysis. Continuous turbidity monitors are installed at Montezuma Creek Bridge. Data collected in 1998 will be used to correlate turbidity to suspended sediment concentration, to the extent possible. If correlation is not reliable, turbidity data will be used directly, in conjunction with hydrology data, to assess perturbing storm events. If a quantitative relationship can be developed, the data will be used to assess sediment transport in relation to the flow regime, in addition to identification of storm events.
- 3.) Cobble Bar Monitoring. Maintenance of cobble bars with open interstitial space has been determined to be important for spawning of Colorado Pikeminnow. Four sites (RM 173.7, 168.4, 132, 131) have been identified in the San Juan River as having characteristics suitable for spawning. These sites have been monitored since 1995. The results of the surveys at this site were used as part of the basis of the flow recommendation at 8,000 cfs. To verify or adjust this recommendation, these sites will continue to be monitored.

Topographic surveys will be completed for each of the sites utilizing total station or gps survey equipment with control provided by the established bench marks

at each site. Surveys will be completed as soon as practical after spring runoff, usually during the end of July or early August. The same area will be surveyed each year to allow comparison to previous years.

At the same time, the structure of the bar will be assessed by completing point counts of the surface bed material ( $n=200$  per sample or more) at each bar. Particles will be selected by the point count method over the full extent of the bar within the survey boundary. Size is determined by placing the rocks through a square hole in an aluminum plate, cut to represent an equivalent screen size from 1 cm through 10 cm at 1 cm increments, then 2 cm increments through 20 cm. Those larger than 20 cm are recorded as greater than 20 cm. Interstitial material smaller than 1 cm is not recorded.

Depth of open interstitial space (depth to embeddedness) will be measured on a 5 or 10-ft grid over the extend of the bar. Measurement will be made by working a hand between rocks until the fingers touch the sand embedded depth. The depth of penetration below the average top of cobble immediately adjacent to the sample point will be measured and recorded as the depth of open interstitial space.

Change in bar morphology will be determined by producing three-dimensional plots of the surveyed surface and subtracting the resulting surface from the surface generated from the previous survey. The amount of change will be correlated to the flow conditions for the year.

The size distribution of cobble at each bar is computed and the  $D_{16}$ ,  $D_{50}$  and  $D_{84}$  sizes reported and compared to previous years. Depth of open interstitial space will be computed as actual depth and multiples of mean cobble diameter.

- 4.) Backwater Perturbation Monitoring. It is proposed that sediment depth and water depth be measured in backwaters twice yearly at the end of runoff in late July or early August and again in October to assess change. The second sampling will be completed during the fall habitat mapping exercise.

Because of the low number of backwaters in any 5-mile reach, 5 backwaters within each geomorphic reach will be measured. An attempt will be made to make the measurements in the same backwaters before and after storm events where possible. All measurements will be made at flows between 500 and 1,000 cfs with an attempt for the two samples to be taken as close to the same flowrate as possible. The habitats sampled will be marked on digital aerial imagery. Sediment and water depths will be measured at three locations in each backwater (mouth, 1/3 and 2/3 points). If a backwater is lost due to sedimentation it will be noted and the depth of sediment measured.

**Products:**

An annual report and data files for inclusion in the GIS database will be produced under this task.

**Budget FY-99 (Funded by BIA):**

| <u>Category</u>       | <u>Cost</u>   |
|-----------------------|---------------|
| Labor                 | \$ 82,860.00  |
| Travel, per diem      | \$ 14,445.00  |
| Vehicle/Equipment Use | \$ 1,930.00   |
| Supplies              | \$ 4,500.00   |
| Overhead              | \$ 1,100.00   |
| TOTAL                 | \$ 104,835.00 |



**Habitat Mapping  
Fiscal Year 1999 Project Proposal**

Principle Investigator: Ron Bliesner  
Keller-Bliesner Engineering  
78 East Center, Logan, UT 84321  
(435) 753-5651 [bliesner@kelbli.com](mailto:bliesner@kelbli.com)

and

Principle Investigator: Vince Lamarra  
Ecosystems Research Institute Research Institute  
975 South State Highway, Logan, UT 84321  
(435) 752-2580 [vincel@ecosysres.com](mailto:vincel@ecosysres.com)

**Study Area:**

The study area consists of the San Juan River from RM 180 (Farmington, NM) to RM 3 (Clay Hills Crossing).

**Collections:**

There are no collections associated with this study.

**Background:**

Habitat mapping completed during the period 1992 - 1997 has been used to develop flow/habitat relationships used in the flow recommendation process. To verify and refine these relationships and examine long term trends, habitat mapping will be continued on an annual basis during the low flow period in the fall.

**Objectives:**

- 1.) Main River Habitat Mapping. Map San Juan River habitat from RM 180 to RM 0 during September-October. This objective is a continuation of the 1997 work at a reduced scale.
- 2.) Digitize and process data utilizing GIS. Habitat mapping data will be digitized and entered into the ArcCAD system.

### Methods:

- 1.) Habitat mapping (San Juan River). One flight to collect digital aerial photography or videography will be completed for the San Juan River from RM 180 to RM 0 and printed at an approximate scale of 200 ft/inch. Thirty-eight categories of aquatic habitat will be mapped in the field utilizing the digital imagery as a base map. The flights and mapping will be completed as soon after runoff as flows reach 1,000 cfs or less and weather will allow. Field mapping will be completed at flows between 500 and 1,000 cfs.

Two of every three miles will be mapped through the full reach, corresponding with the miles designated for sampling under the other long term monitoring work plans.

- 2.) Digitize and process data utilizing GIS. Upon completion of each habitat mapping program (Objectives 1 and 2), the field maps will be rectified and digitized into ArcCAD.

### Products:

An annual report and GIS coverages for inclusion in the GIS database will be produced under this task. The annual report and coverages will be for the 1998 mapping. Reporting for the 1999 mapping will be in the 2000 budget.

### Budget FY-99 (Funded by BIA):

| <u>Category</u>       | <u>Cost</u>  |
|-----------------------|--------------|
| Labor                 | \$ 32,000.00 |
| Travel, per diem      | \$ 2,500.00  |
| Vehicle/Equipment Use | \$ 700.00    |
| Supplies              | \$ 2,500.00  |
| Overhead              | \$ 2,000.00  |
| TOTAL                 | \$ 39,700.00 |

**Water Temperature Monitoring  
Fiscal Year 1999 Project Proposal**

Principle Investigator: Ron Bliesner  
Keller-Bliesner Engineering  
78 East Center, Logan, UT 84321  
(435) 753-5651 [bliesner@kelbli.com](mailto:bliesner@kelbli.com)

**Study Area:**

Temperature recorders are installed from RM 224 (Navajo Dam) to RM 92.5 (Montezuma Creek Bridge).

**Collections:**

None.

**Background:**

Water temperature recorders were installed in 1992. This work element is a continuation of the original work, with station servicing and data extraction.

**Objective:**

- 1.) Collect Water Temperature Data at 7 locations

**Methods:**

- 1.) Collect Water Temperature Data at 7 locations. Temperature recorders are located at Navajo Dam, Archuleta, Farmington, Shiprock, Four Corners and Montezuma Creek and on the Animas River at Farmington. These recorders will be serviced twice and the data extracted and plotted for the annual report.

**Products:**

An annual report and data files for inclusion in the GIS database will be produced under this task.

**Budget FY-99 (Funded by BIA):**

| <u>Category</u>       | <u>Cost</u>        |
|-----------------------|--------------------|
| Labor                 | \$ 4,623.00        |
| Travel, per diem      | \$ 270.00          |
| Vehicle/Equipment Use | \$ 200.00          |
| Supplies              | \$ 200.00          |
| Overhead              | \$ 0.00            |
| TOTAL                 | <u>\$ 5,293.00</u> |

**Water Quality Monitoring  
Fiscal Year 1999 Project Proposal**

Principle Investigator: Ron Bliesner  
Keller-Bliesner Engineering  
78 East Center, Logan, UT 84321  
(435) 753-5651 bliesner@kelbli.com

**Study Area:**

Water samples will be taken at 12 locations along the San Juan River or tributaries between RM 219 (Archuleta) and RM 52 (Mexican Hat).

**Collections:**

Water samples only

**Background:**

Monthly water samples during 1991-1998 have been collected at about 30 different sites in the San Juan River and its tributaries within the study area. The results of the water-quality analyses have shown that most concentrations are replicated between months and among nearby stations. The results of these analyses were used to identify the stations, set the timing and parameters of analysis.

**Objective:**

- 1.) Collect Quarterly Water Samples at 12 Locations.

**Methods:**

- 1.) Collect Quarterly Water Samples at 12 Locations. Depth integrated water samples will be collected at the 12 locations listed in Table 1. Samples will be taken quarterly in February, May, August and November of each year near mid-month. The chemical analyses most relevant to the long-term monitoring goals are listed in Table 2. The concentration of the parameters listed in the first column will be determined every sampling period. In addition field measurements of temperature, pH, redox potential, electrical conductivity and dissolved oxygen will be taken. Annually, during low flow periods in February, the water samples should analyzed for all the parameters listed in Table 2. Field data collection and laboratory analysis will be completed by standard EPA methods, where applicable.

Table 1. Proposed Sampling Stations along San Juan River between Navajo Dam and Mexican Hat.

| Station Name                                 | Station ID | USGS<br>Sampling<br>In Period | BIA<br>Sampling<br>Period |
|--|------------|-------------------------------|---------------------------|
| SAN JUAN RIVER NR ARCHULETA BRIDGE           | 9355500    | 1958-1984                     | 1991-1998                 |
| GALLEGOS CANYON NR FARMINGTON, NM            | 9357255    | 1979-1981                     | 1991-1998                 |
| ANIMAS RIVER AT FARMINGTON, NM               | 9364500    | 1958-1992                     | 1991-1998                 |
| SAN JUAN RIVER AT FARMINGTON, NM             | 9365000    | 1974-1991                     | 1991-1998                 |
| LA PLATA RIVER NR FARMINGTON, NM             | 9367500    | 1977-1991                     | 1994-1998                 |
| OJO AMARILLO CANYON                          | 9367536    |                               | 1993-1998                 |
| SAN JUAN RIVER AT SHIPROCK, NM               | 9368000    | 1958-1992                     | 1991-1998                 |
| MANCOS RIVER NR FOUR CORNERS                 | 9371005    |                               | 1991-1998                 |
| SAN JUAN RIVER AT FOUR CORNERS, CO           | 9371010    | 1977-1990                     | 1991-1998                 |
| SAN JUAN RIVER AT MONTEZUMA CREEK BRIDGE     | 9378610    |                               | 1991-1998                 |
| SAN JUAN RIVER AT BLUFF BRIDGE (HIGHWAY 191) | 9379495    |                               | 1991-1998                 |
| SAN JUAN RIVER NR BLUFF, UT (AT MEXICAN HAT) | 9379500    | 1974-1993                     | 1991-1998                 |

**Table 2. Water quality parameters for analysis**

| <u>Quarterly</u>                               | <u>Annually</u>                 |
|--|---------------------------------|
| Arsenic (total and dissolved)                  | Aluminum (total and dissolved)  |
| Calcium (dissolved)                            | Barium (total and dissolved)    |
| Copper (total and dissolved)                   | Manganese (total and dissolved) |
| Lead (total and dissolved)                     | Nickel (total and dissolved)    |
| Magnesium (dissolved)                          | Potassium (total and dissolved) |
| Mercury (total and dissolved)                  | Strontium (total and dissolved) |
| Sodium (dissolved)                             |                                 |
| Selenium (total, dissolved, total recoverable) |                                 |
| Zinc (total and dissolved)                     | Chloride (dissolved)            |
|  | Ammonia (dissolved)             |
| Alkalinity(HCO <sub>3</sub> )                  | Nitrate (dissolved)             |
| Hardness                                       | Nitrite (dissolved)             |
| TDS  | Silica (total and dissolved)    |
| TSS  | Sulfate (dissolved)             |
| Turbidity                                      | Orthophosphate (dissolved)      |

**Products:**

An annual report and data files for inclusion in the GIS database will be produced under this task.

**Budget FY-99 (Funded by BIA):**

| <u>Category</u>       | <u>Cost</u>         |
|-----------------------|---------------------|
| Labor                 | \$ 4,000.00         |
| Travel, per diem      | \$ 1,000.00         |
| Vehicle/Equipment Use | \$ 500.00           |
| Supplies              | \$ 15,000.00        |
| Overhead              | \$ 1,500.00         |
| <b>TOTAL</b>          | <b>\$ 22,000.00</b> |

**GIS Based Integrated Database Maintenance  
Fiscal Year 1999 Project Proposal**

Principle Investigator: Ron Bliesner  
Keller-Bliesner Engineering  
78 East Center, Logan, UT 84321  
(435) 753-5651 [bliesner@kelbli.com](mailto:bliesner@kelbli.com)

**Study Area:**

The study area for this task is for the San Juan Basin below Navajo Dam.

**Collections:**

None.

**Background:**

In 1996 a GIS database was developed to provide a tool for compiling, maintaining and analyzing all data collected as a part of the San Juan River Basin Recovery Program. All updates will be coordinated through FWS-Region 2, the main repository for the data.

**Objective:**

- 1.) Update and Maintain GIS Database.

**Methods:**

- 1.) Prepare Standardized Data Formats. Utilizing data provided in the past, each researcher will be provided a requested data format for data inclusion to match previous data sets. For new data sets, the format will be developed based upon researcher input.
- 2.) Update and Maintain GIS Database. Datasets provided by each researcher will be added as coverages to the existing GIS database. A CD-ROM will be produced and distributed to researchers by June of each year containing data collected in all previous years. For inclusion, data must be received by March 31. All updates will be coordinated through FWS-Region 2, the main repository for the data.



**Products:**

A CD-ROM containing all data supplied by researchers by the cutoff date will be produced and copies distributed to all researchers.

**Budget FY-99 (Funded by BIA):**

| <u>Category</u>       | <u>Cost</u>         |
|-----------------------|---------------------|
| Labor                 | \$ 20,384.00        |
| Travel, per diem      | \$ 0.00             |
| Vehicle/Equipment Use | \$ 0.00             |
| Supplies              | \$ 1,000.00         |
| Overhead              | \$ 1,010.00         |
| TOTAL                 | <u>\$ 22,394.00</u> |

## **II. PROGRAM MANAGEMENT/REPORTING**

**Program Management  
Fiscal Year 1999 Project Proposal**

Principal Investigator: Larry Crist  
U.S. Bureau of Reclamation  
125 South State Street, Mail Rm 6107  
Salt Lake City, UT 84138-1102  
(801) 84138-1102 [lcrist@uc.usbr.gov](mailto:lcrist@uc.usbr.gov)

**Background:**

Program Management funds are not used to support a specific study or project. Funds reserved for Program Management are used to provide staff time to support individual studies as requested, administer funding agreements and participate in and support Program committees. The bulk of these funds are allocated to Reclamation's Grants and Cooperative Agreements staff, Upper Colorado Regional Office Environmental Resource Group and the Durango Area Office. During 1998 activities conducted by Reclamation included participation in the Recovery Program Committees, coordination of water operations and research activities, and administration of agreements with cooperating agencies. Management funds are important to insure that Reclamation's contributions to the program are properly administered and that funds are transferred in a timely and efficient manner.

**Objectives:**

- 1.) Administer and modify as needed existing Intraagency agreements with; U.S. Fish and Wildlife Service Region 6, U.S. Fish and Wildlife Service Region 2, and the USGS.
- 2.) Administer and modify as needed existing Cooperative Agreements with; the states of New Mexico, Utah, Colorado, and the University of New Mexico at Albuquerque.
- 3.) Administer and modify as needed Service Agreement with U.S. Bureau of Reclamation, Remote Sensing Branch for required services.
- 4.) Distribute Bureau of Indian Affairs contributions to research program through existing agreements.
- 5.) Implement additional Cooperative Agreements or Interagency Acquisitions as needed.
- 6.) Provide staff support as needed to field studies.

**Budget FY-99:**

|                 |           |
|-----------------|-----------|
| Personnel       | \$ 26,000 |
| Travel/Per Diem | \$ 4,000  |
|                 | <hr/>     |
| TOTAL           | \$ 30,000 |

**Program Coordination  
Fiscal Year 1999 Project Proposal**

Principal: Joe Dowhan and Jim Brooks  
U.S. Fish and Wildlife Service  
Albuquerque, New Mexico

(505) 346-2538 [joseph\\_dowhan@fws.gov](mailto:joseph_dowhan@fws.gov)    [jim\\_brooks@fws.gov](mailto:jim_brooks@fws.gov)

**Background:**

The San Juan River Recovery Implementation Program (SJRRIP) is designed to simultaneously address endangered fish species recovery and development of water resources within the Basin. The SJRRIP includes representatives from not only the above mentioned federal agencies, but also the states of Colorado and New Mexico, the Jicarilla Apache Tribe, the Southern Ute Tribe, and the Ute Mountain Ute tribe which all have legal mandated responsibilities to the endangered fish and/or the water resources. The SJRRIP includes three committees. The Coordination Committee, chaired by the Regional Director for Region 2, Albuquerque, functions as the oversight committee, determining policy and reviewing products of the Biology and Navajo Dam Operating committees. The Biology Committee is responsible for developing work plans for answering technical questions regarding recovery and development of San Juan River resources, conduct of studies, reporting of study results, and development of a Long range Implementation Plan to guide research and management efforts. The Navajo Dam Operating Committee serves in an advisory role, primarily to the Biology Committee, to coordinate flow requests designed to address research needs.

As outlined in the Long Range Plan (1994), research information has been employed in the development of a draft flow recommendations report. Included within this report is the reoperation of Navajo Dam to provide dam release designed to improve fishery habitat conditions. The report also identifies frequency and timing criteria for satisfaction of flow recommendations. Major focus during FY 1999 Program Coordination activities will be the finalization and acceptance of the flow recommendations report and completion and dissemination of final reports from the original Seven Year Research Program.

**Budget FY-99:**

|                      |                  |
|----------------------|------------------|
| Personnel            | \$ 28,500        |
| Travel/Per Diem      | \$ 2,500         |
| Meetings, supplies   | \$ 3,000         |
| Printing/publication | \$ 4,000         |
| TOTAL                | <u>\$ 38,000</u> |

**Technical and Editorial Services to Complete the  
Final Flow Recommendation Report  
Fiscal Year 1999 Project Proposal**

Principal Investigator: Paul B. Holden  
BIO/WEST, Inc., Logan, Utah  
Jicarilla-Apache Tribe  
(435) 752-4202 [pholden@bio-west.com](mailto:pholden@bio-west.com)

**Background:**

In 1998 the Biology Committee of the SJRIP completed a draft Flow Recommendation Report that was edited and compiled by BIO/WEST. This report was partially approved by the Coordination Committee in October 1998, but required additional editorial changes before it will be complete. This proposal provides the funding for the editorial and technical services required to complete the Flow Recommendation Report.

**Objective:**

The objective of this proposal is to provide the technical and editorial services necessary to produce the final Flow Recommendation Report.

**Methods:**

BIO/WEST has served as an editorial and technical focus point for the Program in the past by completing annual Integration (Summary) Reports, and in having overall responsibilities for the completion of the Flow Recommendation Report. During 1998, efforts were concentrated on completing a draft Flow Recommendation Report. The BIO/WEST role in 1999 will be very similar to their efforts 1998 as the Flow Recommendation Report is completed. Comments from Biology Committee and Coordination Committee members will be reviewed and editorial changes made where appropriate. Since the Coordination Committee approved all but a few pages of the report in Chapters 7 and 8 in October, proposed changes to chapters other than 7 and 8 will be minor and editorial in nature only. Additions to Chapters 7 and 8 to include a 5,000 maximum release scenario from Navajo Dam, and to update information on the model used in the process, will be completed by Ron Bliesner, and incorporated into the final report by BIO/WEST. Final reports will be sent to all Biology and Coordination Committee members in early December 1998 in preparation for approval of the report by the Coordination Committee in mid-December, 1998. Printing of the final report for distribution will be the responsibility of the Program.

**Products:**

Final Flow Recommendation Report in camera ready format plus sufficient copies for the Coordination and Biology Committees.

**Personnel:**

Dr. Paul Holden will provide overall report coordination for the Flow Recommendation Report. Ms. Sandra Turner, BIO/WEST's Senior Editor, will provide the overall editorial review of the document. Ms. Turner will use her staff of editors, clerical specialists, and cartographers as needed to assist with document completion.

**Primary Contact:**

Dr. Paul Holden  
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FAX: 435-752-0507  
e-mail: [pholden@bio-west.com](mailto:pholden@bio-west.com)

**Budget FY-99:**

|           |           |
|-----------|-----------|
| Personnel | \$ 20,000 |
| Total     | \$ 20,000 |

## **Technical and Editorial Services to Complete the Synthesis Report for the San Juan River**

Principal Investigator: Paul B. Holden  
BIO/WEST, Inc., Logan, Utah  
Jicarilla-Apache Tribe  
(435) 752-4202 [pholden@bio-west.com](mailto:pholden@bio-west.com)

### **Background:**

Since 1991 the San Juan River Basin Recovery Implementation Program (Program) has been involved in a seven-year research effort. Much of the research has been directed by the Long Range Plan, a document prepared by the Program to show its goals and objectives, and the plan for meeting those goals and objectives. As the seven-year research program draws to a close, final reports on the various research projects are due. But a need exists to integrate the findings of those reports and put them in a format understandable to non-biologists, and in a format that shows the accomplishments of the Program in relation to its goals and objectives.

The Synthesis Report will be a brief synopsis of the results of the SJRIP during the 7-year research period as related to the goals and milestones of the Long Range Plan. This proposal provides for the funding for the editorial, and production capabilities to complete the draft Synthesis Report by June 30, 1999 and a final version of the Synthesis Report by the end of September 1999.

### **Objective:**

The objective of this proposal is to provide the editorial services necessary to produce a Synthesis Report that describes the progress and direction of the SJRIP.

### **Methods:**

BIO/WEST has served as an editorial and technical focus point for the Program in the past by completing annual Integration (Summary) Reports, and in having overall responsibilities for the completion of the Flow Recommendation Report. The BIO/WEST role in 1999 will be very similar to their past efforts for the Program.

It is anticipated that the Biology Committee will hold three or four meetings during the early part of 1999 to discuss their progress in relation to the goals and milestones of the Long Range Plan. The BIO/WEST Technical Editor will attend those meetings and work with subcommittees that may be formed to complete written descriptions of progress and/or direction in the future. She will also prepare transitory portions of the documents that tie the various portions together. The Technical Editor and the Senior Editor will then weave the



various sections prepared by various Biology Committee members and subcommittees into a single document. The outline of the document has not been developed, but likely will follow the general outline of the goals and milestones of the Long Range Plan. The document will also discuss proposed changes to the Long Range Plan.

Once the pre-draft document is final, it will be printed and bound, and mailed to the Biology Committee for review. Following review by the Biology Committee, a draft report will be completed incorporating pertinent comments. The draft report will be sent to the Coordination Committee and other Program participants. Upon approval by the Coordination Committee, comments will be incorporated and a final report will be completed. Printing of the final report for distribution will be the responsibility of the Program.

#### **Products:**

Final Synthesis Report in camera ready format with sufficient copies for the Coordination and Biology Committees.

#### **Personnel:**

Dr. Paul Holden will provide overall report coordination and project management. Ms. Yvette Converse will serve as Technical Editor and will work closely with the Biology Committee in developing individual parts of the report. Ms. Sandra Turner, BIO/WEST's Senior Editor, will provide the overall editorial review of the document. Ms. Turner will use her staff of editors, clerical specialists, and cartographers as needed to assist with document completion.

#### **Primary Contact:**

Dr. Paul Holden  
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**Budget FY-99:**

|                    |                 |
|--------------------|-----------------|
| Personnel          | \$ 35,000       |
| Travel             | \$ 2,000        |
| Printing and Misc. | <u>\$ 3,000</u> |
| Total              | \$ 40,000       |

**Peer Review for 1999  
Fiscal Year 1999 Project Proposal**

Principal Investigator: Paul B. Holden  
BIO/WEST, Inc., Logan, Utah  
Jicarilla-Apache Tribe  
(435) 752-4202 [pholden@bio-west.com](mailto:pholden@bio-west.com)

**Background:**

During 1997 a Peer Review Panel was established that included the following scientists:

Dr. Clark Hubbs - Fishery ecologist and professor emeritus from the University of Texas. Clark served on the Peer Review Panel for the Grand Canyon Environmental Studies.

Dr. Peggy Shute - Endangered Fish Biologist with TVA who is actively working on similar endangered species issues in the eastern U.S.

Dr. David Galat - Fishery Ecologist with the National Biological Survey and Missouri Cooperative Fishery Unit who is working on native fishes and instream flow issues on the Missouri River.

Dr. Ellen Wohl - Associate Professor in the Department of Earth Sciences at Colorado State University. Ellen has been involved with peer review of Upper Colorado River Basin projects and has expertise in geomorphology and sediment transport.

Dr. Ron Ryel - Biostatistician and ecologist with experience in population modeling. Ron has been involved with endangered fish issues in the Grand Canyon and the Upper Colorado River Basin.

Dr. Shute was unable to work on the panel in 1997 due to ill health and resigned from the panel in 1998 because of workload considerations. The other four members of the panel participated in meetings in 1997 where the flow recommendations were discussed, and continued involvement in the flow recommendation report process by commenting on the pre-draft report and attending a Biology Committee meeting to discuss the pre-draft report in 1998. They are also scheduled to meet with the Biology and Coordination committees in October, 1998 to discuss the draft flow recommendation report that the Biology Committee sent to the Coordination Committee for review.

It is anticipated that additional integration and final reporting activities will occur in 1999 as final reports for all research during the 7-year research period are due, and a synthesis report is prepared to summarize the results of the program. In addition, a final flow recommendation

report will likely be produced and may need continuing peer review.. The Peer Review Panel will be used to interact with the Biology Committee, meeting with them at least twice during the calender year, and reviewing documents as they are produced.

This proposal provides for funding to maintain the Peer Review Panel activities during 1999.

**Goal:**

The goal of peer review is to provide additional scientific oversight over San Juan River Recovery Implementation Program technical studies and reporting. The Peer Review Panel will work with the Biology Committee to produce scientific credible documents and will assist the Biology Committee in maintaining a highly scientific direction to the Program.

**Methods:**

The Peer Review Panel will meet with the Biology Committee on an as needed basis, but likely no more than two times during 1999. They will also review Program reports when they are in draft and final form, including the final Flow Recommendation Report; the draft and final 1999 Synthesis Report, and any other reports that are produced as end products of the Program. They will also be asked to assist the Biology Committee in developing a long term monitoring program, and will be asked to review 1999 Work Plans. Their reviews will be provided to the Biology Committee through Dr. Paul Holden in letter form, and through discussions at the Biology Committee at meetings. Biology Committee researchers may call Peer Review Panel members to ask for advice, and Peer Review Panel members may call Biology Committee researchers if they have questions concerning Program activities. All correspondence between the Biology Committee and the Peer Review Panel will be coordinated through Dr. Paul Holden, who will maintain a record of these coordination activities for the Program. Additional Peer Review Panel members may be added if a particular expertise is needed by the Biology Committee.

**Products:**

Peer review participation at 2 meeting and letter reports from each peer reviewer.

**Primary Contact:** Dr. Paul Holden  
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**Personnel:**

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**Budget FY-99:**

Payment for serving on the Peer Review Panel includes expenses for travel to and from meetings, and for non-federal personnel (Hubbs, Wohl, Ryel) an honorarium. The honorarium would be sized dependent on the activities of the Peer Reviewer. For example, in 1997 an honorarium of \$1,000 was provided for services related to a meeting with the Biology Committee and discussing the flow recommendation process, and reviewing the pre-draft Flow Recommendation Report. In 1999, it is expected that the level of review, be it through meetings or review of documents, may be at least twice as extensive as the 1997 services. Hence, honoraria of \$2,000 per Peer Reviewer may be more appropriate. In anticipation of increased honoraria, and three meetings with the Program, the following budget is proposed.

|            |    |        |   |
|------------|----|--------|---|
| Honoraria: | \$ | 6,000  |   |
| Travel:    | \$ | 9,600  | (\$800/meeting x 4 people x 3 meetings) |
| Total      | \$ | 15,600 |   |

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Funds remaining from 1998: \$5,600

Total needed from 1999 budget: \$10,000

**Data Integration  
Fiscal Year 1999 Project Proposal**

Principle Investigator: Ron Bliesner  
Keller-Bliesner Engineering  
78 East Center, Logan, UT 84321  
(435) 753-5651 [bliesner@kelbli.com](mailto:bliesner@kelbli.com)

and

Principle Investigator: Vince Lamarra  
Ecosystems Research Institute Research Institute  
975 South State Highway, Logan, UT 84321  
(435) 752-2580 [vincel@ecosysres.com](mailto:vincel@ecosysres.com)

**Background:**

Completion of the synthesis report, integrating all research for past seven years is scheduled for completion in 1999. Support of the integration process requires analysis of hydrology/geomorphology/habitat data in relation to other data sets.

**Objectives:**

- 1.) Provide Hydrology/Geomorphology/Habitat Input to the Integration Process.

**Methods:**

- 1.) Analyze Hydrology/Geomorphology/Habitat Data in Relation to Biological Data Sets. (Continued Task) Inter-relationships between hydrology, geomorphology, and habitat and data collected by other researchers will be analyzed. Those potential inter-relationships will be identified in committee.
- 2.) Participate in Committee Meetings to Review and Discuss Integration Issues. (Continued Task) It is assumed that 2-3 meetings will be held to discuss results, integrate data and exchange ideas.
- 3.) Prepare assigned sections of the synthesis report.

**Products:**

The assigned sections of the synthesis report will be produced under this task.

**Budget FY-99 (Funded by BIA):**

| <u>Category</u>       | <u>Cost</u>  |
|-----------------------|--------------|
| Labor                 | \$ 45,800.00 |
| Travel, per diem      | \$ 8,000.00  |
| Vehicle/Equipment Use | \$ 1,000.00  |
| Supplies              | \$ 1,548.00  |
| Overhead              | \$ 3,000.00  |
| TOTAL                 | \$ 59,348.00 |

**Final Reports - 7 Year Research  
Fiscal Year 1999 Project Proposal**

Principle Investigator: Ron Bliesner  
Keller-Bliesner Engineering  
78 East Center, Logan, UT 84321  
(435) 753-5651 [bliesner@kelbli.com](mailto:bliesner@kelbli.com)

and

Principle Investigator: Vince Lamarra  
Ecosystems Research Institute Research Institute  
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**Background:**

Upon completion of the 7-year research program, final reports will be completed addressing each research study. All data will be prepared and provided for inclusion on the GIS database.

**Objectives:**

- 1.) Compile all data collected throughout the research period.
- 2.) Synthesize data and complete reports.

**Methods:**

- 1.) Compile all data collected throughout the research period. All geomorphology, habitat, water temperature and water quality data collected since 1992 will be compiled, summarized and prepared for inclusion in the GIS database.
- 2.) Synthesize data and complete reports. All relationships developed for the flow recommendation report and others that may contribute to other study objectives will be finalized and reported.

**Products:**

A final report summarizing all data collected during the 7-year research program will be produced under this task.



**Budget FY-99 (Funded by BIA):**

| <u>Category</u>       | <u>Cost</u>  |
|-----------------------|--------------|
| Labor                 | \$ 49,440.00 |
| Travel, per diem      | \$ 0.00      |
| Vehicle/Equipment Use | \$ 1,000.00  |
| Supplies              | \$ 1,000.00  |
| Overhead              | \$ 2,720.00  |
| TOTAL                 | \$ 54,160.00 |

#### **IV. RECOVERY EFFORTS**

**Evaluation of the Effect of Elevated Flows  
on Spawning Success of Red Shiner, *CYPRINELLA LUTRENSIS* (Year 2 of 4)  
Fiscal Year 1999 Project Proposal**

Principal Investigators: David L. Propst  
Conservation Services Program, New Mexico Department of Game and Fish,  
State Capitol, Villagra Bldg, P.O. Box 25112, Santa Fe, NM 87504  
(505) 827-9906 [d\\_propst@state.nm.us](mailto:d_propst@state.nm.us)

and

Principal Investigators: Steven P. Platania  
Division of Fishes - Museum of Southwestern Biology,  
University of New Mexico, Albuquerque, NM 87131  
(505) 277-6005 [platania@unm.edu](mailto:platania@unm.edu)

**Study Area:**

Study sites are located on secondary channels at RM 136 and 128.5

**Collections:**

Specimens collected will be inspected to determine if any rare fishes (Colorado pikeminnow, roundtail chub, and razorback sucker) are present in the seine. Any rare fish > 150 mm TL and all large-bodied native fish (i.e., flannelmouth and bluehead suckers) will be released. All other specimens will be preserved in 10% formalin and returned to the New Mexico Department of Game and Fish Laboratory for identification, enumeration, and measurement (total length and weight).

**Background:**

The red shiner, *Cyprinella lutrensis*, is native to central and southern Great Plains streams of the Mississippi-Missouri and Gulf Coastal drainages (Matthews, 1980). It was first documented in the Colorado River basin near Yuma, Arizona in 1953 (Hubbs, 1954). Since then, the species has become widespread and common in the basin and has been implicated in the decline of several native fishes (Minckley and Deacon, 1968; Douglas et al., 1994; Ruppert et al. 1993). In the San Juan River of New Mexico, Colorado and Utah, red shiner is one of the most common nonnative fish species, particularly in low velocity habitats (Archer et al., 1996; Propst and Hobbes, 1996). These low velocity habitats (backwaters and embayments) are also important nursery areas for larval Colorado pikeminnow (Haynes et al., 1984; Archer et al., 1996). Low numbers of larval (Age "0) Colorado pikeminnow have been captured during most years (1992-1996) of the San Juan River Primary channel (Archer et al., 1996). Although San Juan River secondary channels, after cessation of spring runoff, have mainly low-or zero-

velocity habitats, no larval Colorado pikeminnow was captured in secondary channels prior to 1996 (Propst and Hobbes, 1996).

In November 1996 and August 1997, large numbers of Age 0 Colorado pikeminnow and smaller numbers in August 1998 were stocked in the San Juan River in an effort to determine what factors might be limiting recruitment of young Colorado pikeminnow to the adult population (UDWR 1998 Work Plan). Following their stocking, UDWR personnel regularly sampled low velocity habitats to assess Age 0 Colorado pikeminnow survivorship and characterize the habitats they used (E. Archer, pers. comm.). In addition to being found in low-velocity habitats associated with the primary channel, stocked Colorado pikeminnow were also found in secondary channels. During the autumn 1997 secondary channel monitoring, 240 Age 0 Colorado pikeminnow were found in 20 secondary channels. In August 1998, a single Colorado pikeminnow (ca. 140 mm TL) was captured at the Channel from Hell study site.

In the San Juan River, backwater habitats associated with the primary channel, typically represent a small proportion of the total wetted area available as habitat to fishes (Bliesner and Lamarra, 1996). After cessation of spring runoff, secondary channel habitats are primarily low-velocity and provide comparatively large (surface area) potential nursery habitat for Colorado pikeminnow. Prior to stocking Age 0 Colorado pikeminnow in 1996, the apparent absence of the species in secondary channels may have been precluded by the high abundance of nonnative fishes, particularly red shiner. One possible explanation for the high abundance of red shiner in secondary channel habitats (as well as primary channel backwaters) is the ability of an individual female to spawn numerous times over a season, if water temperatures are within the appropriate range ( $>25$  and  $<35^{\circ}\text{C}$ ; Gale, 1986). Red shiner spawning in San Juan River secondary channels was noted at temperatures between 20 and  $25^{\circ}\text{C}$  (D. L. Propst and K. B. Gido, unpublished data), but most spawning appeared to occur when water temperature was within the range reported by Gale (1986). If red shiners have an extended spawning season in San Juan River secondary channels, this should be reflected in the capture of small larvae ( $<12$  mm SL) for an extended time (ca. 60 to 80 days). However, data from intensively sampled secondary channels indicated that the spawning season for red shiner in the San Juan River is brief. At the Channel from Hell (RM 136) site, Age 0 red shiners were first collected in late-July 1993 and 1994. Length-frequency histograms indicated that the 1993 spawning likely occurred from the second or third week of July through early September (ca. 60 days), but that most spawning occurred during a brief period in late July-early August (ca. 15 days). Data from 1994 indicated that most spawning occurred over a similar or briefer time frame. Fewer red shiner specimens were collected in 1995, but data for that year also suggested a brief spawning season. Greatest density of red shiner at the Channel from Hell site occurred in 1993 when discharge in the channel was very low throughout the presumed spawning season. Spring runoff in 1994 was comparatively low and red shiner density increased with successful spawning and recruitment. In 1995, high spring runoff apparently decreased red shiner density and reduced spawning success. Water temperatures at the Channel from Hell site exceeded  $25^{\circ}\text{C}$  for only 3 weeks or less in 1993, 1994, and 1995. Although Gale (1986) found a strong correlation between red shiner spawning and water temperature and such appears to be indicated by the foregoing data, photoperiod may also influence time of maximum spawning activity (C. Hubbs, pers. comm.).

The above provides evidence to support the contention of Gido et al. (1997) that spring runoff tends to reduce the abundance of nonnative fish in secondary channels. However, even high spring runoff does not eliminate nonnatives. The survivors spawn, and can potentially regain abundance (presumably as a consequence of increased survivorship of Age 0 fish) similar to that prior to high spring runoff.

Although high spring runoff appears to be an important factor in suppressing nonnative abundance, data on the red shiner population in the Channel from Hell suggest it is sufficient only for temporary and short term reductions. Given the documented problems that red shiner (as well as other nonnative fishes) presents to native fishes, particularly those that use low-velocity nursery habitats, additional means to suppress nonnative abundance are needed. The data from the Channel from Hell site suggest that flow spikes during the spawning season of red shiner (preferably in concert with high spring runoff) would contribute to reduction or suppression of the abundance of the species. A correctly-timed flow spike (natural or human-caused) would reduce water temperature below optimal spawning temperature and flush larval red shiner from nursery habitats. Ideally, this reduction would be sufficient to reduce red shiner sufficiently that it would not be a problem for larval Colorado Pikeminnow the following year.

A potential problem with a flow spike of sufficient intensity to reduce red shiner spawning success would be its occurrence when larval Colorado pikeminnow are susceptible to displacement. Conversely, if survival of larval Colorado pikeminnow is impaired by high densities of red shiner, a flushing or spawn delaying flow spike would not diminish the ultimate survival of Colorado pikeminnow in the San Juan River. Red shiner is a short-lived species (maximum longevity < 30 months) and populations of such species must successfully spawn at least every 2 years to survive. Colorado pikeminnow, however, is a long-lived species (> 25 years) and may not have to spawn successfully each year to maintain population viability.

The results of a study such as that proposed herein have implications for the management of undesirable nonnative fishes. If summer flow spikes are demonstrated to have deleterious effects upon red shiner density, particularly in low-velocity habitats, a management option may be to make reservoir releases to mimic summer storm caused flow spikes. A critical issue for such a management option is the volume of water needed to cause the desired effect. This study is designed to identify the threshold flow spike (and thus the volume of water) sufficient to significantly reduce red shiner abundance. During "dry" years, a decision may be made to not use limited water supplies to mimic spring runoff, but to use the available water to reduce red shiner abundance during their spawning season.

### **Objective:**

The overall study objective is to determine if summer storm-caused flow spikes significantly reduce red shiner spawning success and abundance. Data from this study will be used to evaluate the efficacy of using summer reservoir releases to reduce red shiner abundance.

The specific objectives of the study are:

- 1.) Document the response (spawning success and survival of larvae) of red shiner to elevated flows during its spawning season.
- 2.) Estimate the volume and duration of elevated flows required to have a demonstrable negative impact on red shiner spawning success and abundance.
- 3.) Characterize response of other nonnative and native fishes to elevated flows at each study state.
- 4.) Prepare report (using appropriate uni- and multivariate statistical procedures) detailing results of study and use this information to make recommendations to improve the management of nonnative fishes particularly red shiner, in the San Juan River.

### **Methods:**

Study sites are located on secondary channels at RM 136 and 128.5 (also used in the Gido et al., 1997 and Gido and Propst, in press, studies). Each site contains a representative mix of mesohabitats (e.g., pools, riffles, and runs). Thermographs were installed at each site prior to cessation of spring runoff (17 June 1998). During 1998, each site was sampled weekly from the date Navajo Dam releases reached base summer releases (17 June) through 30 August and thence fortnightly through 30 October. The same protocol will be followed in 1999. Sampling will be done by mesohabitat, following the protocol of Gido et al. (1997). All specimens will be preserved (10% formalin), measured ( $\pm 1$  mm TL), and a subsample of female and male red shiners collected at each site will be examined to characterize gonadal conditions. A minimum of 12 mesohabitats will be sampled at each site on each date. Specimens collected from each mesohabitat will be preserved separately. Surface area, mean depth, and mean water velocity will be determined for each sampled mesohabitat. Secondary channel discharge will be determined for each secondary channel during each site visit. Time of maximum spawning activity will be related to accumulated degree-days and photoperiod.

During each year of the study, natural flows will be depended upon to assess their relative impact on red shiner spawning and recruitment success. The weekly sampling schedule ensures that sampling occurs within a few days of any natural flow spike.

For each year of the study, optimal study conditions would include a range of natural summer flow spikes during the presumed peak spawning season of red shiner. However, absence of a flow spike in a particular year would not negate the value of the data collected. A continuum of summer flow patterns from no slow spike through one as high as that during summer 1997 would enable enhanced resolution of the relationship between summer flows and red shiner abundance.

Field work was proposed for 3 years. This year (1999) will be the second year of the study. Data compilation, data analysis, and report preparation will be completed during the fourth year.

Although the focus of this study is to characterize the response of red shiner to summer flow spikes, the sampling methodology enables collection of data on all species (native and nonnative) that inhabit secondary channel habitats during summer. These data may also be analyzed to provide insights to the response of these species to summer flow spikes.

#### Products:

A Draft Annual Report and electronic data files will be delivered by March 31, 2000.

#### Literature Cited:

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- Gido, K. B. and D. L. Propst. in press. Habitat use and associations of native and nonnative fish in the San Juan River, New Mexico and Utah. *Copeia* 1998:00-00.
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#### **Budget<sup>1</sup> FY-99**

##### **Field Studies**

|                              |          |
|------------------------------|----------|
| Personnel                    | \$ 8,000 |
| Travel and Per Diem          | \$ 2,000 |
| Equipment and Field supplies | \$ 4,000 |

##### **Data Compilation and Analysis**

|           |           |
|-----------|-----------|
| Personnel | \$ 10,000 |
|-----------|-----------|

##### **Annual Report and Preparation**

|                        |          |
|------------------------|----------|
| Personnel              | \$ 2,000 |
| Administrative Support | \$ 1,000 |

|       |           |
|-------|-----------|
| Total | \$ 27,000 |
|-------|-----------|

|                |          |
|----------------|----------|
| Indirect Costs | \$ 2,700 |
|----------------|----------|

|              |                  |
|--------------|------------------|
| <b>TOTAL</b> | <b>\$ 29,700</b> |
|--------------|------------------|

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<sup>1</sup>Budget does not include in-kind contributions



**Rare Fish Population Goals  
Fiscal Year 1999 Project Proposal**

Principle Investigator: Vince Lamarra,  
Ecosystems Research Institute Research Institute  
975 South State Highway, Logan, UT 84321  
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and

Principle Investigator: Bill Miller,  
Miller Ecological Consultants, Inc.  
1401 Riverside Ave. Suite 3, Fort Collins, CO 80524  
(970) 224-4505 [mec@millereco.com](mailto:mec@millereco.com)

**Study Area:**

The study area of this investigation is the San Juan River between RM 170 and RM 58.

**Collections:**

Between these river miles, fish, macroinvertebrate and plant collections will be made in the San Juan River. Locations will include runs and riffles within geomorphic reaches where population estimates will be made. A subset of captured fish will be collected for scale or otolith analysis.

**Background:**

A modeling effort to construct a conceptual framework for the fish community and endangered fishes in the San Juan River began in 1998. This effort relates to Sections 5.1; 5.1.1; 5.1.2; 5.1.3.; 5.1.4 of the Long Range Plan. To date these models have directed a focused field effort with the intent of obtaining necessary key site specific data to determine the carrying capacity of pike minnows and razorback suckers in the river.

That model as proposed includes bioenergetics, population, and trophic components. Quantitative data are required as model parameters for fish populations by age class and habitats as well as key trophic components. The intent of the 1998 program is to better parameterize structural and functional components of these conceptual models. Three approaches are currently under investigation each of which is centered on a different hierarchical organization. They are:

- 1.) **BIOENERGETICS.** This approach is individual based (structural) and summed for population effects. In addition, functional energetic (ingestion/egestion, assimilation, etc.) are considered.

- 2.) **POPULATIONS.** This conceptual approach utilizes densities/biomass, size/age structure, etc of individual populations. The populations sizes will be tiered to habitats and habitat requirements.
- 3.) **TROPHIC STRUCTURE.** An attempt is being made to understand the food web structure of the river based upon functional groups. This approach utilizes biomass estimates at all trophic levels and will look at the movement of energy and biomass between trophic groups (IE grazers, detritivores )

Model formulation efforts is ongoing and included a one week effort to determine population estimates for the San Juan River fish community at the upper and lower reaches of the expected habitat range for the Colorado pike minnow. The population estimates were made using multiple pass removal techniques within specific habitat types and for a one mile reach of river using raft mounted electrofishing equipment. The habitat specific electrofishing was conducted using a barge mounted 5.0 GPP Smith-Root multiple electrode array. Habitat specific collections used blocknets and bag seines to delimit the electrofished areas.

The results of that effort show that population and biomass estimates with reasonable confidence intervals can be obtained using the above methods. Specific population estimates by size class (YOY, juvenile and adult) were made using the data obtained at the two river reaches.

The ongoing data analysis will include a comparison of the population estimates at the specific river mile collection locations with relative abundance and capture rates during the fall river wide electrofishing conducted during the seven year research effort. The objective of future collections for population estimates would be to develop a correlation between first pass removal and the relative abundance during the more extensive river surveys.

In addition to fish biomass, biomass estimates for algae, detritus and macroinvertebrates will be made by habitat type in each population estimate area. This will allow relationships to be developed or verified between structural components of the San Juan River.

#### **Objectives:**

Determine population and biomass estimates for the San Juan River fish community within specific habitat types and continuous one mile river sections in River Reaches 3 through 7.

At the same locations, determine structural (instantaneous biomass estimates) on detritus, primary producers, and secondary invertebrate consumers in each geomorphic reach. The data will be collected in an interrelated fashion which will quantify the trophic structure river wide. In addition, primary production and community respiration rates (functional parameters) will be determined.

Because the San Juan River is influenced to a large degree by periods of summer storms and high sediment loadings as well as periods of stable clear fall/winter flows, a temporal aspect of the models will be investigated.

## Methods:

The specific work tasks for this proposal is an intensive electrofishing effort in five reaches of the San Juan River (Reaches 3 - 7). In each reach the following methods would be employed to develop population estimates:

### Specific Habitat Estimates

In each river reach, two riffles and two shoreline run habitats will be selected as locations for multiple pass removal location for small bodied fish population estimates. Three to five removal passes would be made in each selected habitat. The number of removal runs required will be determined by the number of fish collected each pass. The riffle habitat will be sampled over its entire width. In addition to hand held dip nets, a bag seine will be placed downstream of the electrodes to capture stunned fish. A small mesh seine will be placed parallel to the river bank during sampling of the shoreline run and a bag seine positioned at the downstream end of the blocking net. Surface area sampled and seconds electrofished will be recorded for each habitat. Quantitative periphyton and macroinvertebrate samples will be collected at each riffle and shoreline run sampling location

### One Mile River Reaches

A one mile reach will be selected in each of the five river reaches for population estimates. At least four removal passes will be made in each one mile reach using three electrofishing rafts. All removal passes in any one mile reach will be made on the same day. All fish captured, except Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyruachen texanus*) will be retained in separate holding nets and processed after all passes are completed. The rare fish will be weighed measured and released at the end of the pass in which they were collected. Prior to release these fish will be checked for PIT tags and if not tagged, a PIT tag will be placed in all fish of appropriate size. Periphyton ( $\text{gm/m}^2$ ), detritus ( $\text{gm/m}^2$ ), and macroinvertebrates ( $\text{gm/m}^2$  and  $\text{\#/m}^2$ ) will be quantitatively determined within each site where fish population estimates are done.

## Schedule:

Field data collection will require approximately 16 days to complete the fish collections and associated activities. Field work is tentatively scheduled for late August or early September 1999.

**Products:**

A final report summarizing the fish population and trophic level components data will be completed in FY2000. In addition, carrying capacity estimates will be provided utilizing the parameterized conceptual model for the pikeminnow and razorback sucker. The model will have the capability of running management scenarios. The data will be transferred to the San Juan River database administrator by March 31, 2002.

**Budget FY-99 Requested from Program (Miller Ecological Consultants):**

| <u>Category</u>       | <u>Cost</u>  |
|-----------------------|--------------|
| Labor                 | \$ 22,560.00 |
| Travel, per diem      | \$ 6,376.00  |
| Vehicle/Equipment Use | \$ 2,310.00  |
| Supplies              | \$ 0.00      |
| Overhead              | \$ 0.00      |
| TOTAL                 | \$ 31,246.00 |

**Budget FY-99 (Funded by BIA):**

| <u>Category</u>       | <u>Cost</u>   |
|-----------------------|---------------|
| Labor                 | \$ 85,800.00  |
| Travel, per diem      | \$ 19,580.00  |
| Vehicle/Equipment Use | \$ 1,500.00   |
| Supplies              | \$ 1,500.00   |
| Overhead              | \$ 10,838.00  |
| TOTAL                 | \$ 119,218.00 |

**Nursery Habitat Characterization & Use  
Entrainment of Stocked Larval Fish at Cudei  
Fiscal Year 1999 Project Proposal**

Project Manager: Leo Lentsch  
Utah Wildlife Resources  
1594 West North Temple, Salt Lake City, UT 84114  
(801) 538-4756 [nrdwr.llentsch@state.ut.us](mailto:nrdwr.llentsch@state.ut.us)

Field Coordinator: Tom Chart  
Moab Field Station  
1165 South HWY 191 - Suite 4, Moab, UT 84532  
(801) 259-3781 [nrdwr.tchart@state.ut.us](mailto:nrdwr.tchart@state.ut.us)

Early Life Stage Sampling: Fish community monitoring and assessment of nursery habitat requirements for Colorado pikeminnow through experimental stocking.

**Study Area:**

From Hogback, NM (RM 158) to Clay Hills Crossing (RM3).

**Collections:**

Specimens collected will be inspected to determine if any rare fishes (Colorado pikeminnow, roundtail chub, and razorback sucker) are present in the seine. Any rare fish > 150 mm TL and all large-bodied native fish (i.e., flannelmouth and bluehead suckers) will be released. All other specimens will be preserved in 10% formalin and sent to the laboratory for ID.

**Relationship to Long Range Plan:**

- 3.1.2.1.b. Reproduction and recruitment, if any, will be documented. Areas of reproductive activity and nursery habitats will be identified and characterized. This information will be used to evaluate responses to different volumes of water released (including timing and duration) from Navajo Dam and to identify areas of essential habitat.
- 3.3.2.1.a. Characterize existing geomorphic and habitat conditions of the river preparatory for detailed habitat quantification and characterization.
- 3.3.2.1.b. Identify reaches of the river with similar geomorphic and habitat conditions.

- 3.3.2.1.c. Determine usage of specific habitats by endangered fishes as well as other native and non-native species.
- 3.3.2.1.d. Quantify habitat availability and characteristics at different flows to assist in the determination of the biological response of endangered fish species to test flows in the San Juan River. Evaluate the biological response of other species.
- 3.3.2.1.i. Monitor fate and usage by all species of habitats maintained or created by flow regimes, or other means. Evaluate need to continue management practices initiated as a result of this research.
- 3.3.3.1. Habitat availability, use and preference will be examined to determine if flows are adversely affecting habitat conditions.
- 3.3.3.2. Any recruitment and survival to the adult population will be coordinated with augmentation efforts already underway.
- 3.5.2.1.a. Characterize the distribution and abundance of each non-native species.

### **Background:**

This component of research has been designed to characterize the early life stage habitat requirements of the ichthyofaunal community in the San Juan River system. It is directed at specifically determining the seasonal use of low-velocity habitats (nursery) by age-0 and age-1 Colorado pikeminnow (and sympatric species). Platania (1990) estimated that Colorado pikeminnow spawned in the San Juan River during the months of July and August. Hatchery reared YOY pikeminnow have been stocked in the San Juan River since 1996. Efforts have been made to determine the survival, dispersal, and habitat preference of these stocked fish. Intensive sampling of low-velocity habitats is initiated within two weeks of the stocking date. Fall (September) sampling characterizes the fish community in low-velocity habitats and represents the faunal conditions as the community prepares to over-winter. Those fish that over-winter are sampled during the March period. Although these protocols have been written to answer specific questions on the San Juan River, much of the standardized sampling procedures draw heavily from existing protocols used currently on other Upper Basin rivers. The design is not intended to mimic those efforts, but rather to provide a method for comparison of data collected in the different systems.

### **Objectives:**

- 1) To empirically monitor the annual recruitment of age-0 Colorado pikeminnow and sympatric species in relation to flow patterns in the San Juan River.
- 2) To determine downstream transport rates of hatchery reared Colorado pikeminnow larvae stocked in the San Juan River.
- 3) To determine the quality and quantity of low-velocity habitats in the San Juan River
- 4) To determine habitat use by early life stages of Colorado pikeminnow through their first growing season.
- 5) To determine habitat use by the early-life stage ichthyofaunal community in low-velocity (nursery) habitats.

- 6) To determine overwinter survival and growth of experimentally stocked age-0 Colorado pikeminnow.
- 7) To determine the loss to diversion canals of drifting, hatchery reared, larval Colorado through experimental stocking.

## **Methods:**

### ***Task 1 - (Objective 1)***

#### ***Monitoring***

##### **Adult Monitoring**

UDWR will provide personnel to assist in the collection of juvenile and adult fish from the Utah portion of the San Juan River according to approved standardized monitoring protocols.

**Products:** UDWR will provide at least one person to assist in the fall monitoring program, the compilation of pertinent data sets, and the eventual submittal of those data to the database manager.

### ***Task 2 - (Objective 2)***

#### ***Research Activities***

##### **Experimental Stocking of Larvae and Associated Monitoring**

In 1999, 500,000 (target lot size) larval Colorado pikeminnow will be obtained from Dexter National Fish Hatchery and stocked (preferably no earlier than mid-June) into the San Juan River immediately downstream of the Hogback Diversions (RM 158.6). Every effort will be made to delay spawning/hatching of Colorado pikeminnow at the Dexter National Fish Hatchery to mimic natural spawning period in the river. If spawning cannot be delayed to normal spawning time in the San Juan River, emphasis will be placed on stocking fish during the larval stage rather than matching timing of natural spawn with larger fish. No tetracycline marking will be attempted.

Four larval drift stations will be maintained between the release site and Clay Hills. Sampling will be initiated at the time of stocking, occur daily and will continue for two weeks. This portion of the experimental stocking study will be conducted by personnel at University of New Mexico (see pertinent study proposal for sampling specifics and associated budget).

**Products:** Results of the larval drift component of this study will be incorporated in the UDWR annual report.

**Timetable:** Stocking larval CSF- not prior to mid-June 1999.

Larval drift sampling-  
UDWR annual report-

continuously for two weeks immediately following  
stocking (University of New Mexico).  
3/31/98

### ***Task 3 - (Objectives 3-6)***

#### ***Research Activities***

##### **Nursery Habitat Characterization and Use by Stocked Pikeminnow**

UDWR will track the 1999 cohort of stocked Colorado pikeminnow through a continuation of the nursery habitat sampling design.

Five reaches will be intensively sampled in the San Juan River to evaluate survival, dispersal and habitat use of the stocked Colorado pikeminnow: Below Hogback (RM 157-152), Mixer (RM 131-126), Montezuma Creek (RM 89-84), Johns Canyon (RM 25-20), and Grand Gulch (RM 13-8). All backwaters and similar habitat types (i.e. trickle-fed side channels, embayments, pools, etc.) will be sampled.

Sampling location will be recorded on videography prints provided by Keller-Bliesner Engineering. A data sheet (presently prepared by ERI) will be completed describing geomorphic form for each sampling location. The fluvial-geomorphic basis of habitat feature maintenance will be compared to similar habitat types in the Upper Basin. Outside of the intensive reaches, habitats will be sampled at a rate of two habitats/five miles.

Low velocity habitat sampling will commence three weeks after stocking (1 week after the termination of drift sampling). Six trips will be conducted between the time of stocking and November 30. The first four trips will occur on a bi-weekly basis; followed by monthly sampling efforts (Results from fall monitoring will be used in place of September trip. This is covered under NMDGF work plan).

A seventh sampling trip (same protocol as mentioned above) will occur in late March/early April to determine overwinter survival.

- Products:**
- Videography prints recording sampling location will be provided to Keller-Bliesner Engineering for inclusion in the electronic database following each sampling trip.
  - Data sheets describing geomorphic form for each sampling location will be provided to Keller-Bliesner Engineering for inclusion in the electronic database following each sampling trip.
  - Results of nursery habitat characterization and use by stocked CSF component of study will be incorporated into the UDWR annual report.
  - All data collected will be provided in electronic format for inclusion in the GIS database.



**Timetable:** Sampling trips- 7/1999 (2X); 8/1999 (2X); 10/1999; 11/99; 3/2000  
UDWR annual report- 3/31/98  
Electronic Data Submission 3/31/98

### ***Task 4 - Objective 7***

### Research Activities

### Entrainment of Stocked Larvae in Cudei Diversion Canal

Another objective is to determine the effects of diversion canals on age-0 Colorado pikeminnow distribution and survival (e.g., stranding, etc.). By stocking fish above the upper most nursery habitat reach (Below Hogback; RM 158.6), we will be able to determine the affect of Cudei diversion (RM 142) on age-0 fish movement, distribution and survival (e.g., stranding).

Field work will commence at the time of stocking and continue for two weeks or until field personnel identify a point of significantly diminished returns. Larval drift nets will be placed in the Cudei Diversion canal (RM 142) to determine entrainment of a drifting cohort of larval pikeminnow. Collections will be made in 15 minute intervals. The volume of water sampled will be measured ( $m^3$ ) by mechanical flow-meters suspended in the center of the drift net. Catch-per-unit-effort (CPUE) will then be quantified based on number of individuals sampled per unit volume of water versus time sampling.

**Products:**

- Results of the entrainment component of the study will be incorporated into the UDWR annual report.
- All data collected will be provided in electronic format for inclusion in the GIS database.

|                          |                            |   |
|--------------------------|----------------------------|---|
| <b><u>Timetable:</u></b> | Larval drift sampling-     | continuously for two weeks immediately following stocking (approx. mid-June 1999) |
|                          | UDWR annual report-        | 3/31/98   |
|                          | Electronic Data Submission | 3/31/98   |

## **BUDGET FY-99:**

### ***Task 1***

(Task 1 costs refer to UDWR involvement in adult/YOY monitoring)

#### ***Personnel***

Biologist (field/reporting) \$ 1,500

Technicians (field/fish ID) \$ 1,000

***Program Management*** \$ 270

***Sub-total*** \$ 2,770

### ***Task 2***

(Task 2 costs are covered by University of New Mexico's SOW)

### ***Task 3***

#### ***Personnel***

Biologist (field/reporting) \$26,370

Technicians (field/fish ID) \$36,390 (\$23,733/\$12,657)

#### ***Current Expense***

Food \$ 4,400

Mileage \$ 1,320

Equipment \$ 4,400

***Program Management*** \$ 8,770

***Sub-total*** \$81,650

### ***Task 4***

#### ***Personnel***

Biologist (field/reporting) \$ 5,000

Technicians (field/fish ID) \$ 2,500

#### ***Current Expense***

Food \$ 400

Mileage \$ 250

Equipment \$ 1,000

***Program Management*** \$ 970

***Sub-total*** \$10,120

***Total*** \$94,540

***Adjusted Total*** \$79,540

(UDWR will carry over \$15,000 from FY 1998 as a result of a reduced work stemming from a smaller lot of stocked fish)

**Determining Downstream Transport Rates of Hatchery-Reared  
and Stocked Colorado Pikeminnow in the San Juan River  
Fiscal Year 1999 Project Proposal**

Principal Investigator: Steven P. Platania  
Division of Fishes - Museum of Southwestern Biology,  
University of New Mexico, Albuquerque, NM 87131  
(505) 277-6005 [platania@unm.edu](mailto:platania@unm.edu)

Principal Investigator: Leo Lentsch  
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Principal Investigator: Tom Chart  
Utah Division of Wildlife Resources  
Moab Field Station  
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**Study Area:**

We will establish at least four sampling stations between the release site (immediately downstream of the Hogback Diversion; RM 158.6) and Clay Hills Boat Landing (RM 2.9). We anticipate that the other two sampling stations will be at RM 128 (just upstream of the Four Corners Bridge) and Mexican Hat (RM 53). If funded, our sampling effort would include making collections in reaches of the San Juan River under the jurisdiction of the National Park Service (Clay Hills Boat Landing; RM 2.9).

**Collections:**

All fish specimens collected will be sorted, identified and preserved for curation in the Division of Fishes, Museum of Southwestern Biology (MSB), Department of Biology, at the University of New Mexico.

**Background:**

The Utah Division of Wildlife Resources (UDWR) has proposed, in their FY 1999 San Juan River work plan, the experimental stocking and subsequent monitoring of up to 500,000 recently hatched (yolked) larval Colorado pikeminnow. That proposed study is deemed a continuation of their previous investigations of dispersal and habitat use of stocked larval Colorado pikeminnow. The principal difference between UDWR's previous investigations (1996-1998)

and the 1999 research was the size of the Age 0 fish to be released. In their previous studies, UDWR released fish  $\bar{x}$ =xx mm TL (x-x mm TL; 1996),  $\bar{x}$ =xx mm TL (x-x mm TL; 1997), and  $\bar{x}$ =25 mm TL (20-40 mm TL; 1998). Neither of their three initial investigations employed fish that, when released into the river, would be considered a component of the drift community. Conversely, if the 1999 study is funded, an important issue that must be addressed is the downstream transport of the stocked larval Colorado pikeminnow.

That Colorado pikeminnow drift for a portion of their early life history has been well documented by numerous studies throughout the Upper Colorado River Basin. Larval drift studies in the San Juan River (1992-1997) have documented the dispersal of this and other species via drift. In 1998, we (UNM-MSB) conducted a study, using an artificial material, to determine the rate of downstream transport of drift in the San Juan River. That study indicated that travel rates ranging between 1.6-2.4 miles per hour. Those data (still in a draft form) may provide a means of assessing the disposition of Colorado pikeminnow and indicate what proportion of their reproductive effort is transported into Lake Powell.

If funded, we will perform the portion of the UDWR study involving the assessment of downstream transport of larval Colorado pikeminnow. This will require continuous sampling, during the two week period immediately following the release of hatchery reared larval Colorado pikeminnow, at several locations between the release point and Lake Powell. In addition, we propose to use this opportunity to compare the results of our 1998 study (which employed artificial drift materials) with the drift dynamics of natural material (larval Colorado pikeminnow). This latter portion of the study would be performed concurrent with the assessment of downstream drift of Colorado pikeminnow and not involve additional cost except for the purchase of additional quantities of the artificial drift material.

#### **Objectives:**

- 1.) Determine downstream transport rates of hatchery reared Colorado pikeminnow larvae stocked at a single location in the San Juan River.
- 2.) Compare downstream transport rates of hatchery reared Colorado pikeminnow larvae with transport rates of "artificial eggs" (material used in 1998 study)
- 3.) Correlate rates of downstream transport with hydrology and river morphology

#### **Methods:**

Sampling for drifting hatchery reared larval Colorado pikeminnow will be conducted for up to two weeks after the release of the test specimens. Sampling will occur in the San Juan River at four stations between the release site (immediately downstream of the Hogback Diversion; RM 158.6) and Clay Hills Boat Landing (RM 2.9). The putative release date is not to be prior to mid-June 1999.

Drifting larvae and artificial eggs will be collected with Moore Egg Collectors (MEC). At least one of these collecting devices will be employed at each of the four sampling stations. Collections will be made continuously beginning soon after the simultaneous release of larval Colorado pikeminnow/artificial eggs and continue until field personnel can identify the sustained lack of collection of either larvae or eggs. (This period will probably be 2-3 days at the uppermost site but may be up to 10-days [from the initial appearance of study material] at the lowermost site). Collections will be made in 15-minute periods and the volume of water sampled by each MEC will be measured by mechanical flow-meters suspended in the center of the collection devices and quantified as  $m^3$ . This information ( $m^3$ ) will allow us to determine catch per unit effort based on volume of water sampled versus time sampling.

The UDWR has indicated (in their 1999 work plan) that they will be responsible for determining the entrainment of stocked larval Colorado pikeminnow in the Cudei Diversion Canal (RM 142). We will coordinate sampling efforts with UDWR personnel to ensure comparability between collecting gear and data generated from this study.

All fish collected, in addition to released Colorado pikeminnow, will be retained, preserved in the field and returned to the laboratory for processing. Catch rate data will be compared within and across sites and models of downstream transport rates of both Colorado pikeminnow and artificial eggs will be generated.

#### **Products:**

A draft report of the 1999 study to determine downstream transport rates of hatchery-reared and stocked Colorado pikeminnow in the San Juan River will be prepared and distributed to the San Juan River Biology Committee for review by 31 March 2000. Upon receipt of written comments, that report will be finalized and disseminated to UDWR (for incorporation into their summary report of the overall project) and to members of the San Juan River Biology Committee by 1 June 2000. Fish collected from this study will be curated in the Division of Fishes, Museum of Southwestern Biology (MSB), Department of Biology, at the University of New Mexico. Original field notes will be retained in the Division of Fishes and collection information will be electronically stored in a permanent MSB database program. Electronic copies of the field and collection data will be transferred to the San Juan River database manager following the successful protocol previously employed.

**Budget FY-99:**

**Personnel**

|                          |           |
|--------------------------|-----------|
| Field Technicians        | \$ 10,000 |
| Field Research Associate | \$ 3,000  |

Subtotal \$ 13,000

**Travel and per diem**

|                |          |
|----------------|----------|
| Travel         | \$ 2,000 |
| Field per diem | \$ 2,800 |

Subtotal \$ 4,800

**Annual Report and Preparation**

|                        |          |
|------------------------|----------|
| Personnel              | \$ 2,000 |
| Administrative support | \$ 1,000 |

Subtotal \$ 3,000

**Equipment and Supplies**

|                               |          |
|-------------------------------|----------|
| Artificial Eggs (4 bags)      | \$ 1,400 |
| Mechanical Flow Meters (4)    | \$ 1,300 |
| Laboratory Equipment/supplies | \$ 300   |

Subtotal \$ 3,000

Total \$ 23,800

Overhead (15%) \$ 3,570

GRAND TOTAL \$ 27,370

### III. RESEARCH ACTIVITIES

**Non-Native Species Monitoring and Control  
Fiscal Year 1999 Project Proposal**

Principal Investigators: Jim Brooks and Jude Smith  
New Mexico Fishery Resources Office  
U.S.F.W.S., Albuquerque, NM  
(505) 346-2538    [jim\\_brooks@fws.gov](mailto:jim_brooks@fws.gov)

**Study Area:**

The work plan covers removal of non-natives from the San Juan River between Farmington, NM (RM180) and Clay Hills Crossing, UT (RM 3)

**Collections:**

All non-native fish captured will be removed from the river.

**Background:**

Introduced species have been implicated in the decline of several native fishes. In the Colorado River drainage, introductions occurred simultaneously with flow-related habitat alterations. These events coincided with a basin wide decline in distribution and abundance of many native species, in particular the Colorado pikeminnow and razorback sucker. Various laboratory and field studies have described the interactions among native and non-native species. Impacts on native fishes include resource overlap in both diet and habitat use (i.e., potential competition), predation, and hybridization.

During 1991-1997, this component of the San Juan River research has focused on the identification of the impacts of non-native species on the native fish community. Research has characterized the distribution and abundance of non-native species in main channel habitats, seasonal movements of channel catfish and common carp, the food habits of non-native predators, primarily channel catfish, the overlap of resource use between native and non-native fish species, and the relation of these findings to differing flow regimes. Channel catfish are the single most abundant large non-native predator in main channel collections. Data indicate that channel catfish occupy a variety of habitats within the main channel, generally exhibit localized movement, and at lengths > 450mm prey upon native species.

During 1998, control efforts were continued and formalized to reduce the abundance of channel catfish in the San Juan River downstream of Farmington. Channel catfish were removed by raft-mounted electrofishing and transplanted by Navajo Nation hatchery trucks to closed impoundments managed for recreational fisheries. This effort is strongly supported by the Navajo Nation and the State of New Mexico. In addition to electrofishing, hoop netting was employed after initial efforts in 1994-1995 proved largely unsuccessful. Hoop netting methods were altered, including the time of year, the type of bait used, length of time set, and instream



location of net sets. The hoop netting under the altered sampling regime was successful in capturing large numbers of channel catfish in the reach between the PNM weir and Hogback, where catch rates for channel catfish are highest, and will be employed in future removal efforts.

This workplan proposes to continue mechanical removal of channel catfish and other non-native species in conjunction with main channel adult monitoring and rare fish stocking efforts. Monitoring data on the distribution, abundance and food habits of non-native species will continue to be collected and analyzed. In addition, removal and transplantation of San Juan River channel catfish to isolated impoundments currently used for recreational fisheries will be continued and expanded to recreational fishing waters under the jurisdiction of the State of New Mexico. Support will also be provided for completion of study integration efforts and issue of flow recommendations.

### **Objectives:**

- 1.) Continue data collection and mechanical removal of non-native species during main channel adult rare fish monitoring efforts.
- 2.) Evaluate data for non-native species to determine effects of mechanical removal on abundance and distribution patterns.
- 3.) Continue, refine and expand program for mechanical removal and transplantation of channel catfish.
- 4.) Monitor the influx of lacustrine nonnative fish species into the San Juan River upstream of Lake Powell and determine predative impacts via stomach content analysis.
- 5.) Continue data integration efforts for production of flow recommendations from Navajo Dam.

### **Methods:**

Mechanical removal will occur during the fall main channel monitoring efforts. Hoop netting efforts will be employed on a selective basis in association with main channel sampling efforts. During these sampling efforts, all nonnative species collected will be sacrificed and data recorded for species identification and enumeration, ontogenetic stage (young-of-year, sub-adult, adult) if collected from a non-Designated Mile, and standard and total lengths and weight for Designated Mile collections. Data will be summarized by geomorphic reach and sampling will occur two out of every three river miles. Tagging data for recaptured channel catfish and common carp tagged during 1993-1996 will be recorded in the field and integrated into existing databases for movement and abundance.

Lacustrine non-native species (primarily striped bass, walleye, largemouth bass) collected in the San Juan River will be sacrificed for stomach content analysis in the laboratory to identify predation on rare and other native fish species. Stomachs will be removed, preserved in 10% formalin and data will be recorded for predator species identification, standard and total lengths, weight and sex. Stomach content analysis will identify frequency of occurrence and weight by individual prey species, stomach fullness and relate standard length of identifiable prey species to predator standard length.

Separate efforts for mechanical removal and transplantation of channel catfish from the San Juan River to Navajo Nation and State of New Mexico waters will commence during March and April 1999. Electrofishing will be employed during March/April efforts when water temperatures are low and during fall main channel sampling efforts. Captured channel catfish will be measured, weighed, examined for external fish health condition and transported by hatchery truck to receiving waters on a daily basis during two five day efforts during spring sampling and during the first four days of the fall sampling (Hogback to Four Corners) . When water temperatures have warmed to 25 ° C (August/September), hoop netting efforts will be employed in the San Juan River between the PNM weir and Hogback, where long-term catch rates for adult channel catfish are highest. Fifteen to twenty hoop nets will be deployed in deep (> 1.0 m), low velocity habitats, baited with a disgustingly rotten cheese/livestock blood mixture, and run at one week intervals from mid-August to mid-September. Captured fish will be measured, weighed, examined for external fish health condition and transported to receiving waters. A formal management plan will be completed to identify agency responsibilities, methods of capture and holding and transport for all receiving waters for channel catfish mechanically removed from the San Juan River.

### **Products:**

Participation will continue in data integration efforts to incorporate 1997-1999 data, produce a final report and formulate flow recommendations for reoperation of Navajo Dam and Reservoir. An electronic data file will be provided for inclusion in the centralized database by 31 March 2000. An annual report detailing findings will be completed in draft by 31 March 2000 for SJRIP Biology Committee review and finalized by 1 June 2000.

**Budget FY-99:**

**Personnel:**

|   |           |
|---|-----------|
| Population monitoring                                   | \$ 15,500 |
| Channel catfish translocation coordination/mgt. plan    | \$ 4,000  |
| Nonnative species removal/channel catfish translocation | \$ 34,500 |
| Reporting/data management                               | \$ 7,500  |

Subtotal \$ 61,500

**Travel/per diem:**

|                           |          |
|---------------------------|----------|
| Population monitoring     | \$ 4,500 |
| Removal/translocation     | \$ 1,500 |
| Reporting/data management | \$ 1,500 |

Subtotal \$ 7,500

**Equipment and supplies**

|                          |          |
|--------------------------|----------|
| Population monitoring    | \$ 2,000 |
| Removal/translocation    | \$ 5,500 |
| Integration/final report | \$ 500   |

Subtotal \$ 8,000

**TOTAL \$ 77,000**

**Evaluation of Stocked Razorback Sucker  
Fiscal Year 1999 Project Proposal**

Principal Investigators: Dale Ryden and Frank Pfeifer  
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**Study Area:**

The study area for razorback sucker monitoring extends from river mile (RM) 158.6 (Hogback Diversion) downstream of Farmington, New Mexico, to RM 76.4 (Sand Island boat landing) downstream of Bluff, Utah.

**Collections:**

All non-native fish captured will be removed from the river. All native fish captured will be returned to the river live.

**Background:**

Razorback sucker are native to the San Juan River. At present this species is extremely rare in the San Juan. In order to gain information on habitat use, possible spawning areas, and survival and growth rates of hatchery-reared razorback sucker in the wild, it was necessary to experimentally stock a small number of fish. The information obtained during the experimental stocking study was used to develop and implement a plan for full-scale augmentation of this species in the San Juan River. Integration of razorback sucker experimental stocking data with data from adult fish community monitoring studies, Colorado pikeminnow macrohabitat studies, contaminants studies, habitat mapping studies, and non-native species interaction studies, provided information essential to the development of flow recommendations for reoperation of Navajo Reservoir. Information obtained during the evaluation of stocked razorback sucker will help address objectives 5.1 through 5.5 in the San Juan River Long Range Plan.

In August 1997, a Five-Year Augmentation Plan for Razorback Sucker in the San Juan River was finalized. Stocking of razorback sucker from various sources into the San Juan River began in early September 1997. Between 3 and 19 September 1997, a total of 2,885 razorback sucker were stocked into the San Juan River at Hogback Diversion, New Mexico. The first group, stocked 3 September 1997, consisted of 1,027 fish that were collected from Lake Mohave as larval fish in 1996 and reared at Willow Beach National Fish Hatchery (NFH) in Arizona. The second group, stocked 17 September 1997, consisted of 227 fish that were progeny of various crosses between Green River adults between 1989 and 1995 and were reared at Ouray NFH. The last group, stocked 19 September 1997, consisted of 1,631 fish, were 1996 progeny of

paired matings between San Juan River of Lake Powell adults and Colorado River arm of Lake Powell adults or Upper Colorado River adults. This last group was raised at various facilities in Grand Junction, Colorado. All stocked fish were PIT-tagged before release into the wild.

In early spring of 1998, approximately 8,000 razorback sucker obtained from Lake Mohave were placed in a grow-out pond at Ojo Amarillo, just south of Farmington, New Mexico. On 22 April and 28 May 1998, 124 razorback sucker, progeny of paired matings between Green River adults, reared in golf course ponds in Page, AZ were harvested and stocked into the San Juan River at Hogback Diversion. On 14 and 15 October 1998, 1155 of the fish from Ojo Amarillo pond were also harvested, PIT-tagged, and stocked at Hogback Diversion.

Thus, to date, a total of 4,164 razorback sucker have been stocked since the five-year augmentation effort for this species was begun. Follow-up monitoring has begun and will continue on razorback sucker monitoring and main channel fish community monitoring ("adult monitoring") trips.

#### **Objectives:**

- 1.) Determine habitat use and needs, site preference, and movement patterns of hatchery-reared razorback sucker in the wild.
- 2.) Determine survival rates and growth rates of hatchery-reared, known-age razorback sucker in the wild.
- 3.) Determine whether hatchery-reared razorback sucker will recruit into the adult population and successfully spawn in the wild.
- 4.) Finalize report for results and findings from 1994-1997 razorback sucker monitoring studies. Produce a report for results and findings of 1998 razorback sucker monitoring field work.

#### **Methods:**

Objectives 1-5: Two sampling trips will occur in 1999 to monitor stocked razorback sucker. Both trips will sample from Hogback Diversion to Mexican Hat, Utah. The spring sampling trip will occur before runoff begins, in late March or early April. The summer trip will occur just after the hydrograph has returned to summer baseflow, or about mid-July. If razorback sucker should be implanted with radio transmitters (see below), radiotelemetry will take place on razorback sucker monitoring trips, adult monitoring trips, and opportunistically during other research efforts (ie. - mechanical removal) throughout the year. Mechanical removal of nonnative fish species will take place on all razorback sucker monitoring trips.

Electrofishing, seining, and trammel netting will be used to determine dispersal, and survival of stocked fish. Radio telemetry will be used to monitor razorback sucker movements and habitat utilization, with the goal of trying to identify spawning behavior and spawning areas.

Electrofishing and handling of rare fish species will follow the protocol found in the main channel fish community monitoring workplan, except that electrofishing will be done every mile, instead of 2 out of every 3 miles. PIT tag number, length, weight, reproductive status, and general health information will be recorded for razorback sucker recaptured during electrofishing. Recaptured razorback sucker that have been in the river for longer than two years will be implanted with radio transmitters and monitored for habitat use to see if their habitat use differs from that of newly stocked razorback sucker and to locate possible spawning areas. During radiotelemetry contacts, detailed habitat information on substrate, depth, cover, velocity, and relation of this habitat to other habitats (riffle, pools, main and secondary channels, backwaters, shore, etc.) will be recorded. Water quality parameters including dissolved oxygen, water temperature, conductivity, and pH will be measured at each location. General movement patterns will be determined through radio telemetry as well. At the end of a radio telemetry contact, attempts will be made to recapture radiotelemetered fish via trammel netting and/or seining. Recapture efforts will be aimed at gaining data on age, growth and sexual status as well as trying to recapture any other razorback sucker that might be aggregating with radiotelemetered fish, especially during the potential spawning season.

The Service will have the lead for the razorback sucker monitoring and other cooperating agencies will provide personnel and equipment as needed.

#### **Products:**

A draft of the final report for the 1994-1997 razorback sucker monitoring study is expected to be available by January 1999. A draft report for razorback sucker monitoring trips conducted in 1998 is scheduled to be available by 31 March 1999. Finalization of both these reports is scheduled to be completed by 1 June 1999. Costs for the finalization of the 1994-1997 razorback sucker monitoring report and producing a draft of and finalizing the 1998 razorback sucker monitoring report are included in the budget for this workplan. DBASE IV files containing information on total catch and length/weight data gathered for rare fish species on these trips will be submitted for inclusion on the San Juan River Recovery Implementation Program integrated database CD-ROM by 31 March 1999.

**Budget FY-99:**

**Personnel costs**

|                                |           |
|--------------------------------|-----------|
| 1 GM-13 Supervisor             | \$ 3,000  |
| 1 GS-11 Fishery Biologist      | \$ 11,000 |
| 1 GS- 7 Administrative Support | \$ 1,000  |

|   |          |
|---|----------|
| Data integration and final report costs | \$ 5,000 |
|---|----------|

|                 |          |
|-----------------|----------|
| Travel-Per Diem | \$ 4,500 |
|-----------------|----------|

|                        |          |
|------------------------|----------|
| Equipment and Supplies | \$ 4,000 |
|------------------------|----------|

|          |           |
|----------|-----------|
| Subtotal | \$ 31,500 |
|----------|-----------|

|  |          |
|--|----------|
| Service Administrative Overhead (22.00%) | \$ 7,000 |
|--|----------|

|       |           |
|-------|-----------|
| TOTAL | \$ 38,500 |
|-------|-----------|

**Collection of Larval Razorback Sucker from Lake Mohave  
for Use in Augmentation Efforts in the San Juan River  
Fiscal Year 1999 Project Proposal**

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**Study Area:**

Larval razorback sucker will be obtained from Lake Mohave in the Lower Colorado River Basin. Fish will then be transported to and reared in Ojo Amarillo pond, a 2.4 acre pond, on the N.A.P.I. farm just south of Farmington, New Mexico. Fish will be held in Ojo pond until the time of harvest and stocking. Harvested fish will be transported to Hogback Diversion (RM 158.6) and stocked into the main channel of the river below the diversion structure.

**Collections:**

Collections consist of larval razorback sucker to be transported from Lake Mohave to the San Juan Basin.

**Background:**

In August 1997, a Five-Year Augmentation Plan for Razorback Sucker in the San Juan River was finalized. Stocking of razorback sucker from various sources into the San Juan River began in early September 1997. The five-year plan called for 31,800 razorback sucker to be stocked into the San Juan River in Year 1. Between 3 and 19 September 1997, a total of 2,885 razorback sucker were stocked into the San Juan River at Hogback Diversion, New Mexico. On 28 May 1998, 124 more razorback sucker were stocked into the river, again at Hogback Diversion. In addition, approximately 8,000 razorback sucker were obtained from Lake Mohave and placed Ojo Amarillo pond just south of Farmington, New Mexico. These fish are scheduled to be harvested and stocked into the San Juan River in October 1998.

Numbers of razorback sucker available to the San Juan River Recovery Implementation Program (SJR-RIP) for 1999 and outyears of the five-year augmentation effort are limited and will not be able to fulfill numbers specified in the plan for fiscal year 1999. The only source presently available for making up the shortfall in desired numbers of stocked fish is Lake Mohave. During spawning season in Lake Mohave, large numbers of larval razorback sucker can be collected in a very short time by dipping the larvae as they are attracted to lights suspended from boats. Collection of larval razorback sucker and transport to and rearing in Ojo Amarillo pond



south of Farmington will allow the SJR-RIP to obtain a large number of razorback sucker for use in the five-year augmentation effort for this species.

**Objectives:**

- 1.) To obtain larval razorback sucker to be raised in Ojo Amarillo pond, for later use in the five-year augmentation effort for razorback sucker in the San Juan River.
- 2.) To plant and rear Lake Mohave razorback sucker in Ojo Amarillo pond in spring 1999. These same fish will be harvested from Ojo pond in fall 1999 and PIT-tagged.
- 3.) To stock harvested, PIT-tagged razorback sucker into the San Juan River at Hogback Diversion in support of the Five Year Augmentation Plan for Razorback Sucker in the San Juan River.

**Methods:**

Members of the U.S. Fish and Wildlife Service's Colorado River Fishery Project Office in Grand Junction, Colorado will assist in the annual collection of larval razorback sucker in Lake Mohave. Collected larval fish will be transported via stocking truck and planted in Ojo Amarillo pond for rearing to a stockable size. Trap netting will be used to subsample razorback sucker and analyze growth. Razorback sucker will be harvested in the fall of 1999, PIT-tagged, and stocked (via stocking truck) at Hogback Diversion, in support of the Five Year Augmentation Plan for Razorback Sucker in the San Juan River.

Handling and transport of larval razorback sucker will follow existing U. S. Fish and Wildlife Service protocols.

The Service will have the lead for the collection of larval razorback sucker. Other cooperating agencies may provide personnel and equipment if needed. This workplan includes labor costs for the collection of larvae, transport of razorback sucker to Ojo pond, harvest, PIT-tagging, and stocking.

**Products:**

A letter report will be produced documenting the work accomplished.

**Budget FY-99:**

|  |                 |
|--|-----------------|
| Labor                                    | \$ 6,000        |
| Travel-Per Diem                          | \$ 1,000        |
| Equipment and Supplies                   | <u>\$ 3,000</u> |
| Subtotal                                 | \$ 10,000       |
| Service Administrative Overhead (22.00%) | <u>\$ 2,200</u> |
| TOTAL                                    | \$ 12,200       |

NOTE: Tags are to be purchased directly by USBR.